THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

Etc.

VOL. LXXXVI.

APRIL TO JUNE, 1904.

LONDON:

WALTER KING,

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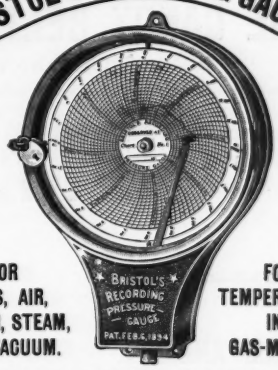

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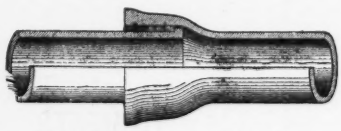

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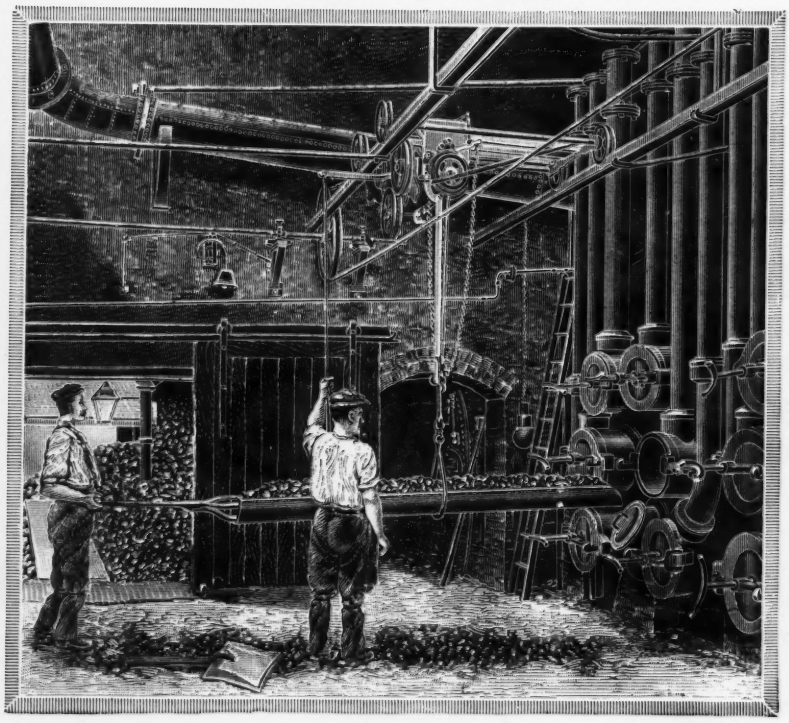

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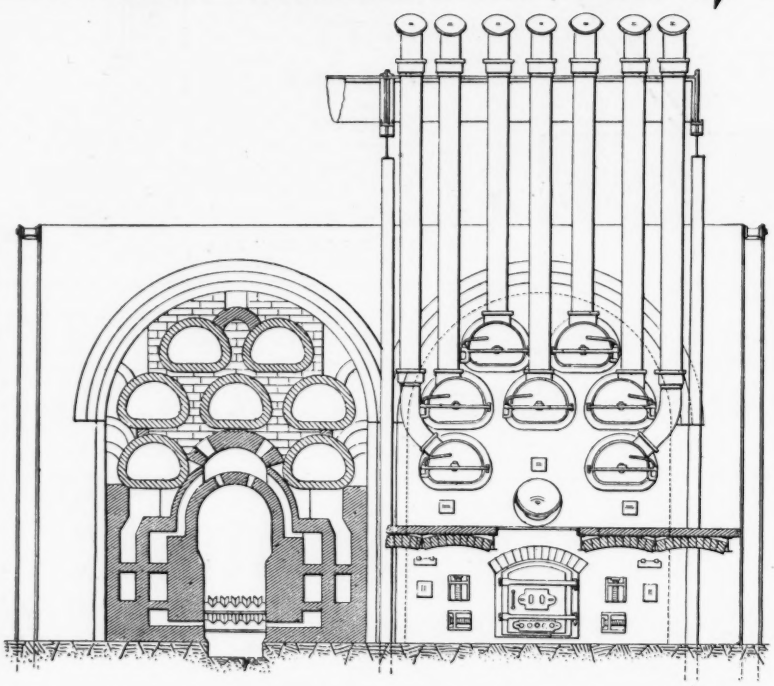

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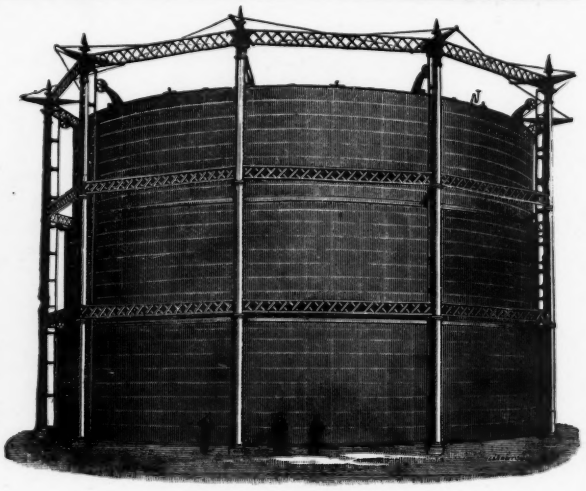

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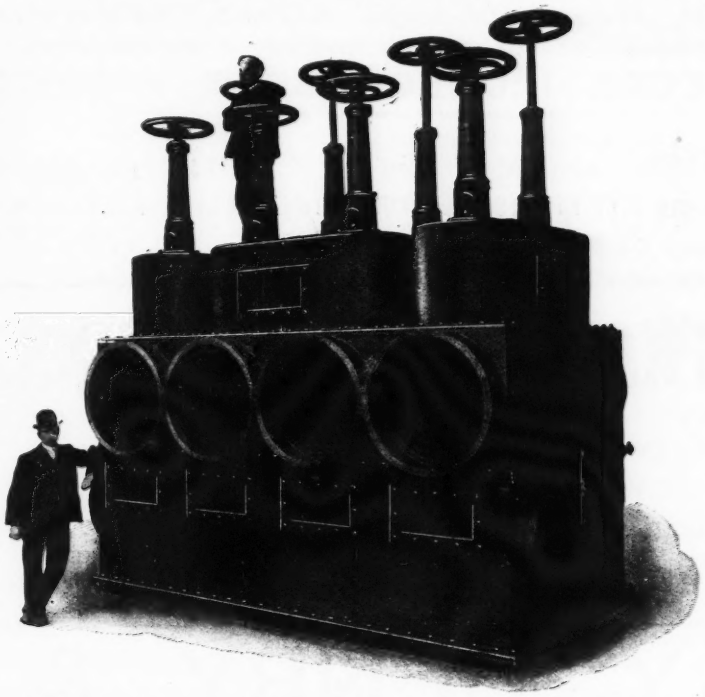

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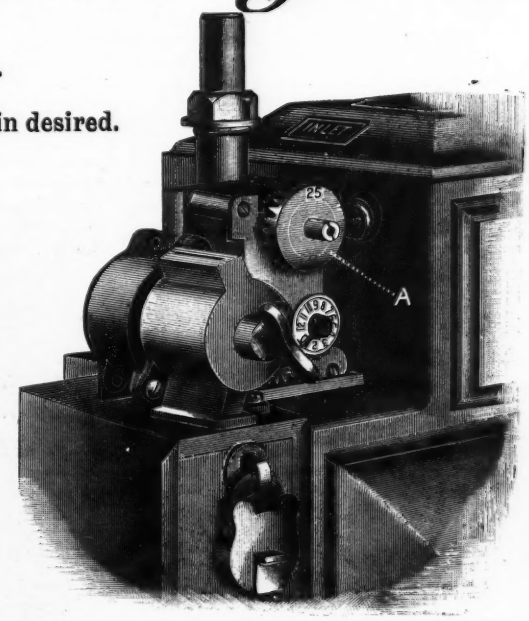

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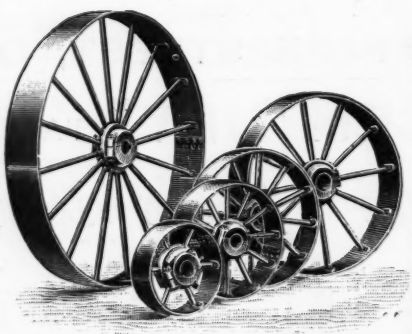

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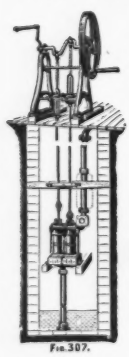

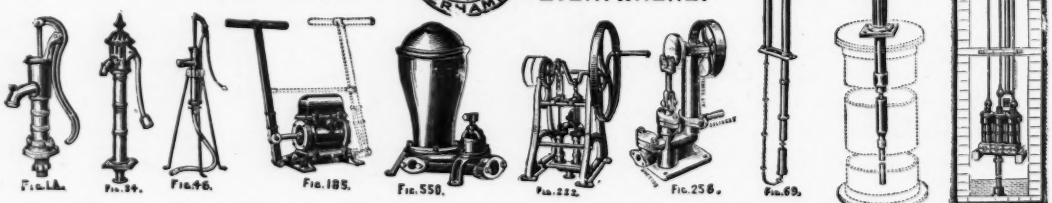

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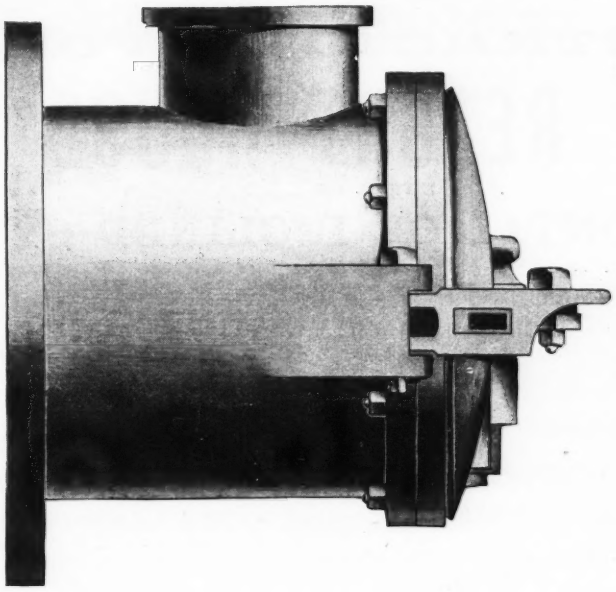

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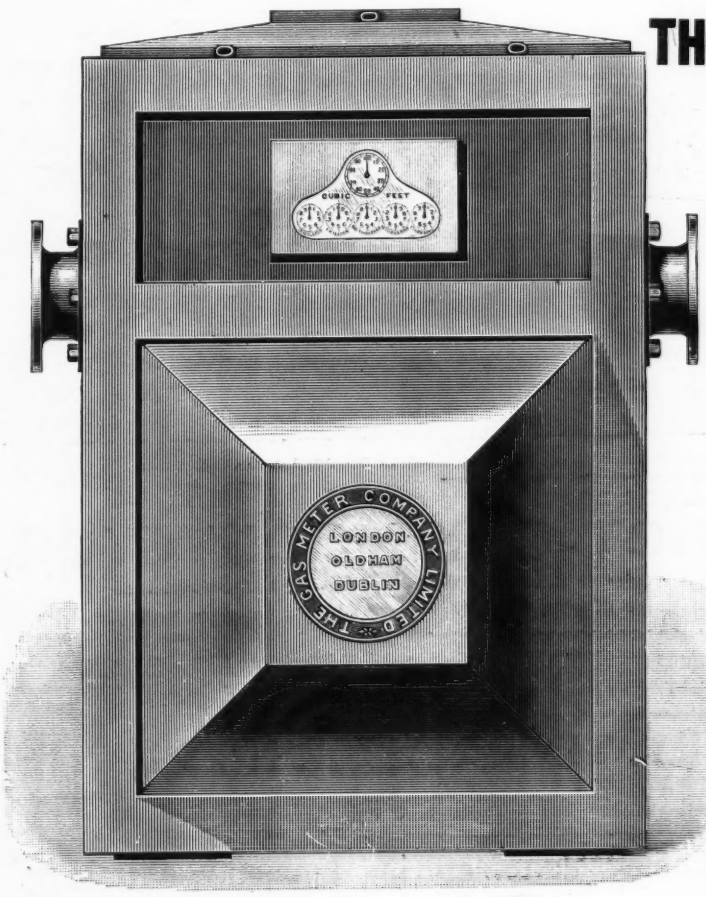

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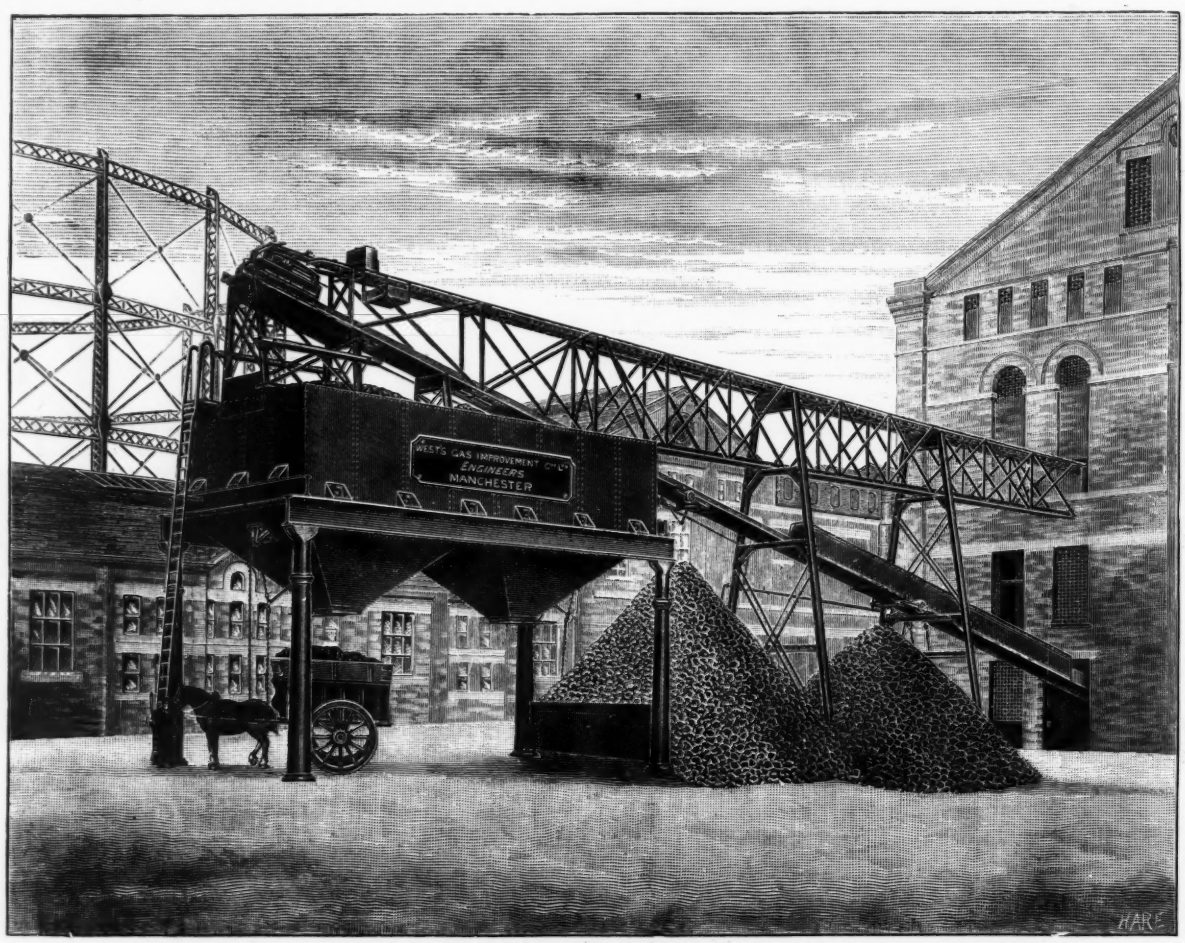

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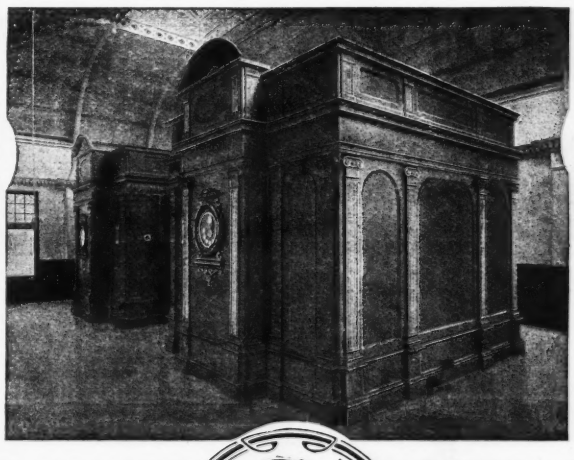

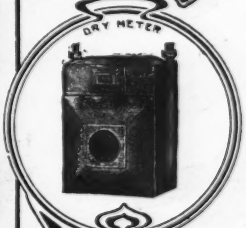

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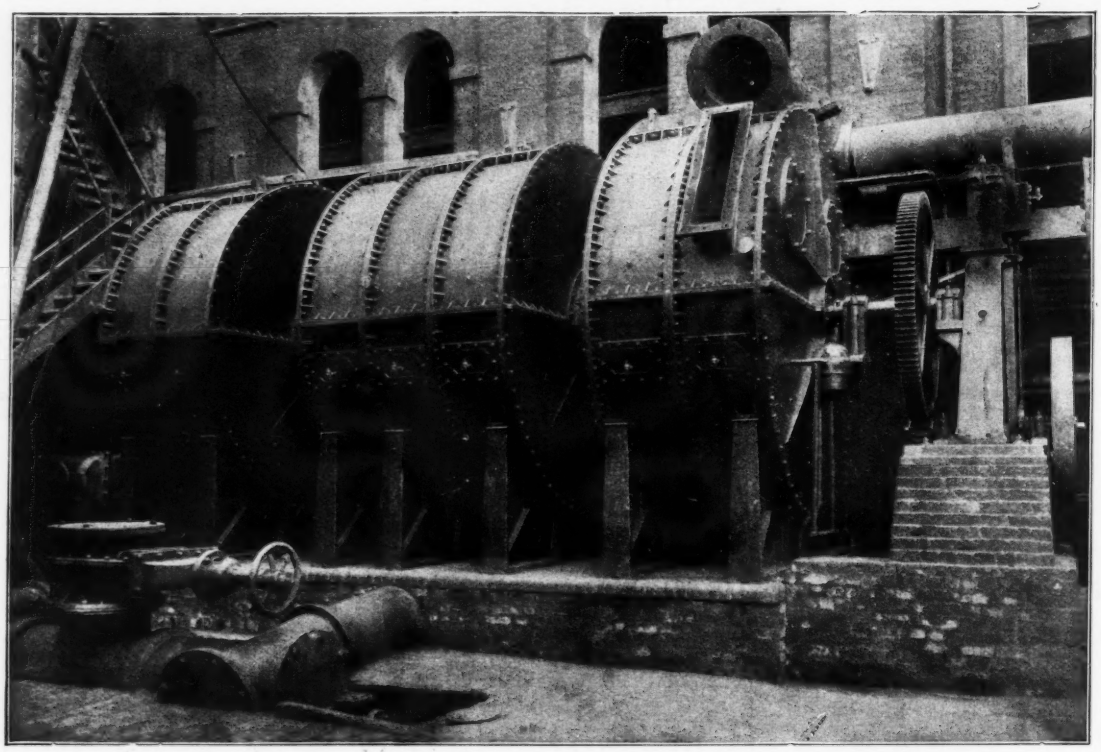

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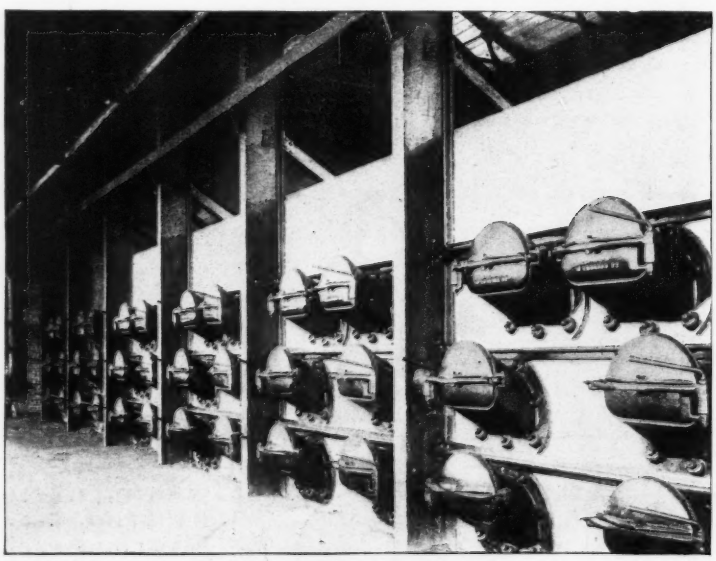

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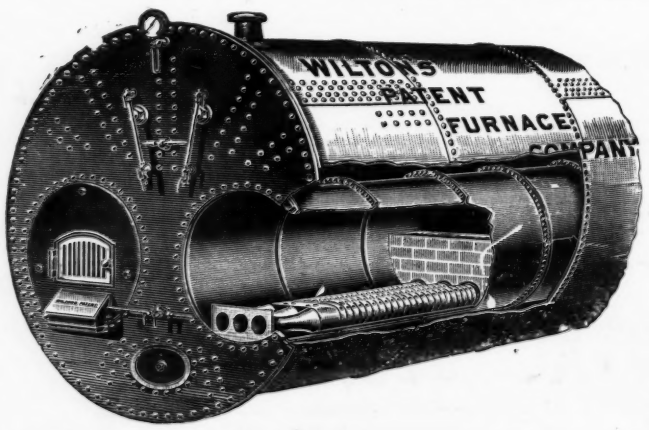

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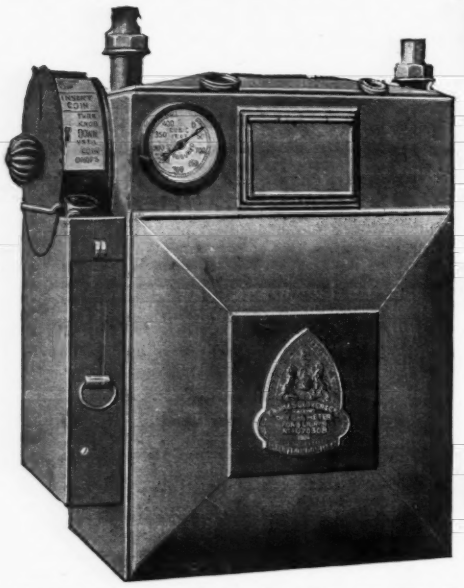

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EDITORIAL NOTES—GAS, &c.

Gas Accountancy.

IN the rank of the few who are specialists in gas-works accounts, readers of the "JOURNAL" need not be told that Mr. William Cash, F.C.A., takes place; and that, when he delivers himself on his own particular subject, what he has to say must be taken as coming from one who speaks with authority. He addressed the Chartered Accountants' Students Society a few days since, taking the form of gas companies' accounts as his theme. His lecture throughout was rather informative than critical. This circumstance, however, does not detract from its value as a guide not only to students of accountancy, but to those who are entering in any sphere into the management of gas undertakings; and there are not a few who pose as adepts in the art of gas administration who would do well to thoroughly digest this exposition by Mr. Cash of how to properly order their financial statements.

It is some years now since Mr. Alfred Lass (whom, by the way, we are glad to know in his retirement is in possession of improved health) brought before the then members of the same Society some of the special features of gas accounts; and it can only be hoped that this fresh breaking of the ground by Mr. Cash before the students will do something towards enlisting their interest to an extent sufficient to turn their attention to this branch of their profession. It must, however, be admitted that, speaking generally of gas companies, they have not given any great encouragement to the development of gas account specialists. It is a regrettable and all too common experience that the boards of even some important gas companies composedly countenance the election from the shareholders of men for the duty of auditing who have no more knowledge of what the law demands in this respect than the "man in the moon." We believe that in some cases this is done in virtue of a special provision in their Private Gas Acts. More the pity. It is a condition of things that should be remedied. Under such circumstances, it is no small wonder that the work is perfunctorily and unpractically done, and that ofttimes companies are found arraigned before Parliamentary Committees for having violated, in some respect or other, the Acts that govern their operations. A joint audit by an elected shareholder and an expert in gas accounts is much to be preferred; and such a union would be a safeguard to all interests, and should prevent any act transgressing the law governing the financial operations. It is a welcome sign of the recognition of the professional gas auditor that (as Mr. Cash finds) in at least three Gas Bills in the present session of Parliament sections are included as to audit, in which provision is made for audits by professional accountants. "I should like," Mr. Cash says very naturally, "to "see the inclusion of some such provision more general. "Amateur auditors no doubt do their best; but the lack of "special training in a number of instances that have come "under my own personal notice has proved most detrimental "to all concerned."

Speaking of the model form of accounts, Mr. Cash gave expression to the view that their form is "admirably adapted "for its purpose, is particularly full and complete, and well "thought out and designed." They enable, too, comparisons to be made between one undertaking and another which are really instructive and of material service. This is true with a qualification. The model form dates back to 1871; and there have been many changes in gas supply since, for which there is no provision in the accounts, which were only "complete" as things were in 1871. They now require revision. To mention but two matters. The prepayment meter system and the introduction of carburetted water gas have introduced a new order of things which should be properly legislated for in gas accounts. Mr. Cash himself refers to the extension of the statement dealing with coals by the addition of a line for oil; but in how many revenue accounts on the expenditure side is any special information given as to the costs attaching to the purchase and delivery of the oil? As a rule, these costs are all lumped together with those for coal. Even in the accounts of the hypothetical City Gas and Coke Company which Mr. Cash presented to the accountancy students, no such particulars are found in the revenue account, though he gives a special line to oil in the "statement of coals, &c." Such a system of massing together the costs of these two diverse raw materials—while being unjust to both—is neither "instructive" nor of any "material service;" and it effectually defeats any attempt to make comparisons between one undertaking and another. There may be undertakings (the Crystal Palace District Gas Company are an example), but they are in an insignificant minority, who discriminate between the coal and oil; and the majority who do not follow this course completely elude comparison. When revision is made in the model form of accounts, the amalgamation or division of the costs for the coal and carburetted water-gas manufacture should not be left to discretion, but should in all respects be distinctly separated. These are two or three points suggested by Mr. Cash's useful lecture.

A Marylebone (née Bermondsey) Clause.

IT may have come, at first glance, as a pleasant surprise to readers of the "JOURNAL" who mourned in spirit with Mr. D. Ford Goddard over his ill-success with the "Bermondsey "clause," when he pressed it upon the House of Commons in the form of an instruction to the Select Committee on the Marylebone Electric Lighting Bill, that a clause distantly resembling the one in question was after all inserted in the Bill, by the Select Committee. The further circumstance that the added clause appeared in the "filled-in" Bill, so as to secure freedom from the opposition of the Great Central Railway Company—not of the Gas Company at all—is the best possible answer perhaps to the protestation, dangerously approaching to claptrap, uttered by Mr. A. Bonar Law, the Parliamentary Secretary of the Board of Trade, against the motion of the member for Ipswich. This fact ought to be taken note of by the Board of Trade, the partisans of municipal trading, and the electric lighting interest, as proof that the wishes of the great voteless ratepayers are not to be set at naught, as has hitherto been the practice. So far, therefore, the further history of the Marylebone Electric Lighting Bill has not been without reassuring incident.

When the text of the new Marylebone clause is studied attentively, however, the first flush of satisfaction at the imposition of a bar to the victimization of the ratepayers by the Borough Council, for the sake of their great white elephant, the electric lighting undertaking, will fade away in the cold light of critical appreciation of the adroitness with which the advisers of the Council have seemingly contrived to avoid the substance, while apparently conceding the form of restriction. It is not the Bermondsey clause at all that actually appears in the Marylebone Bill, but only something nearly resembling it that the Railway Company were persuaded to accept as satisfaction of their demand for protection, while it may possibly prove to be wholly inoperative in this sense. Such, at any rate, is the judgment of those other large ratepayers, the Gaslight and Coke Company. As reported in the "JOURNAL" last week, the Company's advisers are of opinion that the alterations made in the original Bermondsey clause, to which the Railway Company took no exception, are such as to render nugatory the whole scheme of protection which it is the purpose of the clause to enact. So serious is this allegation—of which the Gas Company thought so much that they briefed Mr. Balfour Browne, K.C., and Mr. Erskine Pollock, K.C., to bring it before the Committee—that we have deemed it worth particular examination. It will be remarked that the contention of the Company failed; the Committee refusing to alter the wording of the clause. This fact immensely enhances the gravity of the situation, inasmuch as it allows of the presumption that the Marylebone clause is an improvement on the original Bermondsey clause, and is therefore the form that Parliament should be

asked to accept henceforward as the right precedent in this special connection.

It will be agreed that the wording of the Bermondsey clause is plain and unambiguous. It simply requires that the local authority to which the provision applies, shall once each year cause to be laid before them an electricity undertaking budget so framed that the estimated revenue and expenditure for the ensuing year shall balance; and that thereupon the charges for electricity shall be based on what is shown to be necessary to produce this equilibrium, and so obviate bringing any loss upon the rates. The plan is so clear, and so obviously in accordance with the invariable intention with which local authorities embark upon electric lighting, that opposition to it on the part of the authorities seems most illogical. The only real objection to it (and the validity of the objection we have frequently admitted) lies in the period within which it is enforced. There should be a term of grace, during which a new undertaking should be allowed to develop on lines along which it is intended to be run. The opponents of the Bermondsey clause usually pretend that it is, of its essence, to operate from the very start of a municipal undertaking; but this is said merely to create prejudice. There is no reason why a local authority, seeking powers to engage in electric lighting, should not be asked to specify the period at the expiration of which they expect to make both ends meet; and the operation of the clause might be fixed for that time.

Let us ascertain now wherein the new precedent of the Marylebone clause differs from the original which it is supposed to embody. The difference lies in the addition of the words "having regard to any steps which the Council may "decide to take to decrease the expenses or increase the "revenue of the undertaking," as a qualification of the obligation to make the charges for electricity meet the expenses of the undertaking. It is the contention of the Gas Company that these words destroy the whole of the guarantee. The Committee evidently thought differently—that is, if they thought over the matter at all. The position was peculiar. Here was one petitioner calling in question a clause which had been agreed with the promoters of the Bill. It satisfied the Railway Company, but did not satisfy the Gas Company. If the Committee had listened to the Gas Company, the effect would have been to upset a bargain struck by others, in their absence. Doubtless, the view taken by the advisers of the Gas Company is a sensible one. It is impossible to say beforehand what the added words may hereafter be held to cover. On the face of it, there is put upon the Borough Council a certain—or more properly speaking an uncertain—amount of restriction, as to the fixing of their charges for electricity. The only question remaining is, how far this restriction extends. Until some indication is given of what it means, it would be rash in the extreme for those who feel the want of the protection of the original Bermondsey clause to admit this serious qualification of its "categorical imperative." As a precedent, therefore, this Marylebone clause will not do at all. Nobody yet knows what it means. Speaking from the point of view of fair dealing (not of legal sharp practice), one would say that the parenthetical exception can only properly apply to some minor matter not calculated to defeat the main object of the clause. It would be making Parliament a laughing-stock to assume that it would accept a clause for an Act, subject to a reservation which could be so interpreted as to render the rest meaningless.

Meanwhile, it remains for all concerned to ask themselves very seriously what these interpolated words of the Marylebone clause signify. It is a well-understood and common-sense rule of construing any verbal alteration of a statutory precedent, to pay the most particular heed to the extreme possibilities of interpretation. Nobody can suppose that such alterations are made for nothing. Consequently, it is of the first importance to sift out their ultimate scope, which may possibly be hidden from a cursory glance. The advisers of the Gaslight and Coke Company cannot be blamed for placing the very worst interpretation, from their point of view, on the strange words. The interpolation challenged this treatment. At the same time, and while rejecting the Marylebone emendation of the Bermondsey clause as in any way an improvement, one would like to hear argued (in this connection) the application of the legal principle that explanatory and subsidiary provisions are to be interpreted in conformity with, not in opposition to the spirit of, the major enactment itself. Not speaking with legal authority, of course, anyone would hesitate before placing much reliance on this general rule—say, to support a motion for an injunction; but it is worthy of respect, for all that.

Some Topics Concerning Coal.

The rejection the other day of a proposal brought forward in the Glasgow City Council for the acquisition of a municipal coalfield was duly mentioned in the "Journal;" but it may be worth a word or two of comment, as illustrating how the passion for municipalization, like others, grows by feeding. It is almost needless to remark that the professed apologists in the newspapers for the "principle" saw nothing objectionable in this absurd project, which, be it remembered, was not new. A few years ago, when the price of coal rose everywhere, more than one raw Communist in British municipal life rushed to propose the same thing. It is remarked, in defence of the revived idea, that "municipalities cannot be blamed if they take precautionary "measures. They cannot be expected to unprotestingly "submit to a coal ring making successful industrial under-"takings financial failures. And they have the duty, too, "of protecting individual ratepayers against the grasping "greed of speculators who never know when they are well "off. This kind of argument opens up a pleasing prospect of the municipalization of everything, which can only stop when everybody is in municipal employment, and all live out of the rates paid by themselves. The hackneyed suggestion—originally offered, it is believed, to explain the means of existence cultivated by the population of the Isle of Man during the winter season, that they eke out a frugal livelihood just by taking in one another's washing—fades into inanity before this prospect. At the present juncture, moreover, the notion that the output of coal is an enterprise that can be fittingly municipalized, is more than ordinarily fantastic. It was recorded in the "Journal" last week that the Royal Commission on Coal Supplies had made a second report, which really amounted to no more than a reminder to the public that the whole subject is one of as much difficulty as importance. The minutes of evidence and appendices referred to in this report have since been published as a Blue Book; and it will be far more to the advantage of the community of coal consumers, if those who claim to hold opinions concerning the economics of this industry will turn their attention to the facts now given to the world, instead of indulging in chimerical visions of altering the course of the trade. We shall have to deal in due course with the contents of this Blue Book, in continuation of our last year's labours on the subject. The evidence of the witnesses then in question, it will be remembered, was mainly concerned with the problems of deep mining, the working of thin seams, and waste. The present volume is chiefly devoted to the consideration of economies in the after-treatment and the utilization of coal for industrial purposes. It contains evidence by Sir George Livesey, Professor Lewes, and many others. One of the appendices treats of the increasing popularity of sulphate of ammonia as a fertilizer, which is illustrated by the advance of the market value of sulphate over a period of ten years.

The Attendance of Gas Officials at Fires.

The disastrous fire in the city of Baltimore, which is reported to have cost British Fire Insurance Companies alone upwards of a couple of millions sterling, furnishes ample evidence of the fact that, with all our modern improvements in building construction, and the large extension of electric lighting, the risk of fire in large collections of buildings is still very considerable. So far as the available information extends, the gas supply of Baltimore, or the gas-works, had no more to do with the origin or spread of the conflagration than the general use of electricity in the city had in preventing or limiting its ravages. It is as well to place this observation on record; because the presumed superiority of electric light to gas from the fire standpoint is so tremendously overworked, in the newspapers and in public discussions, that the general impression undoubtedly is that in the use of the former illuminant there is comparative safety. The truth of the matter is, that when it is a question of really serious fire, no such element of causation as this possesses any magnitude whatever. The origination of many great conflagrations is in itself insignificant. Time and again there

are outbreaks, such as the recent gas-main fire in Piccadilly, which, if there were any rule of proportion in the scheme of causation, ought to do a deal of mischief; but they do not. On the other hand, somebody throws down a lamp, or even a lighted match, and a town is swept out of existence. What we wish to lay stress upon, in the present instance, is the great importance of a thorough understanding being arrived at betimes between the Fire Departments of large towns and the lighting authorities—especially the gas company. This agreement should cover all the detail points of the attendance of gas officials at fires with a view to cutting-off work, the danger of "gassing," and other matters. Of course, in most well-organized cities this is attended to; but, still, exceptional cases occur occasionally to prove that the understanding that should have existed between the firemen and the gasmen was wanting. It would be highly regrettable if anything of the kind were to arise on a large scale, or on an important occasion. The necessity of seeing to the emergency lighting by gas of railway tunnels in towns, theatres, churches, and the like, has frequently been urged in these columns; and it is to be hoped that it is not overlooked. Many an engineer, we feel quite certain, when going into a crowded assembly in some unfamiliar building, is reassured by the sight in the corridors of the trustworthy flat-flame gas-light indicating a way to safety. It is worth knowing that at Baltimore the well-known mill, or "slow-burning," building construction of staircases and floors in solid wood beams, did not justify itself. Reinforced concrete seems to have answered best. But the most striking lesson of all was the value of shuttered, or even wire-glazed, windows, in preserving buildings fitted with them.

The Measurement of Electricity Leakage.

A MYSTERIOUS reference in the "Builder" for the 19th ult. has considerably exercised our curiosity, which, oddly enough in the circumstances, there has been no means of satisfying. It consisted of a statement that Mr. W. E. Groves read a paper that week before the Birmingham Local Section of the Institution of Electrical Engineers, on the measurement of insulation resistance and leakage losses from direct-current networks. The importance of the subject needs no advertisement. Our contemporary claims to having pointed this out six or seven years ago; and we are not concerned to dispute the claim, for the "Builder" has always been well informed in these matters. Then our contemporary proceeds to remark, that if it is important in Birmingham to measure the insulation resistance and the leakage losses from direct currents, it is no less important in London. After discussing some of the author's suggestions for keeping up the supply even in the event of a bad fault happening in a main—including some heroic "wrinkle" which has the effect of making the consumers' meters run backwards—it is mentioned that Mr. Groves "has invented "an instrument which reads the insulation resistance of "the whole network directly when connected to the mains." We should like to hear more of this instrument. As the "Builder" observes, "there can now, therefore, be no excuse "for engineers refusing to publish this figure. It will be "interesting to know what these figures are for the distri- "buting systems in London. When they are published, we "can easily calculate the maximum and minimum possible "values of the electrical energy lost by leakage, and also— "which will interest the water and gas companies more— "the maximum and minimum values between which the "actual leakage currents must lie. Tests we made a few "years ago proved that these currents were in some cases "very large." The remarkable fact is, that nowhere else have we seen the slightest notice of Mr. Groves's paper. Three issues of leading electrical journals have appeared since the date assigned to the paper; and no reference to it do they contain. This backwardness in publishing important technical communications is not usual. Why the text or the substance of Mr. Groves's paper has not transpired, except by this casual reference to it in the "Builder," seems to require some explanation. Central station engineers are by no means free, as is hinted, with their confessions of how much current they are losing, which, for all they know, may be working mischief with pipes underground. It strikes one as just possible that this instrument of Mr. Groves's may be the very thing wanted; and for this reason further information respecting it and its revelations in Birmingham and elsewhere will be eagerly awaited. Of course, we have no desire to raise the suspicion of mystery where none exists. There may be nothing in all this to justify the suspicion that possibly an electrician may have been a little too outspoken. If we are in error, we will gladly withdraw and apologize; but, on the face of it, there is at least some cause for wonderment that a means of filling up the gap in central station statistics with something much more definite than the "utilized in distribution" of current electricity-supply accounts has been noticed in the "Builder" of the 19th ult., and nowhere else.

A Concentration of Experiences.

The British Gaslight Company stand unique in gas enterprise in this country, in that they carry on their operations in five places—Hull, Norwich, the Potteries, Trowbridge, and Holywell—greatly dissimilar in their characteristics, and situated in widely separated parts of the country. It may be taken therefore that, when the workings of these five undertakings (which are graduated, too, in the scale of their operations from a high to a low point) are brought within focus, as they are every half year at the meetings of the shareholders, there we have fairly represented the general experiences of gas undertakings throughout the country in the corresponding period. If the report of the Directors for the past half year, and the address of Mr. Corbet Woodall (who acted as *locum tenens* for the Chairman, Mr. J. Horsley Palmer, in his absence on a journey taken to recuperate his health) are attentively examined for the purpose of comparing the results at the Company's stations, it will be found how remarkably alike the experiences were during the six months, notwithstanding the great variations in the districts, in points of size, populations, and industrial features. At all stations, the consumption of gas increased; and at those for which the figures are given, the receipts for coke and tar were also higher. Ammoniacal liquor, however, showed a little weakness by insignificant decreases at Norwich and the Potteries. The price of coal, too, was lower per ton in all cases—the differences ranging between 1s. 5d. in the case of Hull and 5d. at Trowbridge. Notwithstanding that coal was lower, coke presented improvements in prices at three out of four of the stations. Hull remained at the old figure; but at Norwich there was a gain of 2d. per chaldron, at the Potteries of 1s. 2d. per ton, and at Trowbridge of 3d. per ton. These are experiences which have been fairly common throughout the country. A large amount of reconstruction is also going on at the Company's works. At Hull, an inclined retort installation is being made. At Norwich, some extensive changes are well in progress; and, as the particulars given by Mr. Woodall show, they are of an exceedingly interesting character for engineers. At the Potteries, the new works have given rise to a knotty point, which is being submitted to the Courts, in order that the respective rights of the Company as occupiers of the surface and of those who own the coal lying beneath, may be determined. The new works were largely necessitated through the subterranean operations of the coal owners at the old site; and it was hard and discomforting when the erection of works on the new site was well in hand to have a notice of the intention of the coal owners to undermine that site also. That was the ill-fortune of the Company; hence the appeal to the Courts.

Reduced Illuminating Power in Brazil.

It is a matter of gratification to direct special attention once more to the experiences of the San Paulo Gas Company, in view of the application by them, at the distant seat of their operations, of the policy encouraged by example by some of the foremost gas administrators of to-day in this country, in lowering the illuminating power of the gas, making a considerable reduction in price, and pushing the use of incandescent burners to the utmost extent. The adoption of this policy is no doubt largely due to the influence of the Managing-Director (Mr. A. F. Phillips). The general scheme of the Company's proposal was outlined in the "JOURNAL" immediately following the Company's annual meeting last year; now we have the first effects of the changes then announced. During the whole year, the price of gas for private consumption has been 140 reis per cubic metre, in place of 170 reis; during the last three months the price of gas for public lighting has also been at 140 reis, and in the same quarter the illuminating power has been 14 candles instead of 17 candles.

By Sept. 13 last, the whole of the gas-lamps in the city and suburbs—4049 in number—were converted to the incandescent system. Therefore, for nine months, the Company were receiving 30 reis less per cubic metre from the gas supplied for private purposes; and during the last quarter the full effect of the new policy was—both in respect of price and illuminating power—brought to bear upon the business. At the beginning of the year, there was commercial depression in San Paulo; but notwithstanding this, the material reduction in the price of gas, and the loss of £2000 in the receipts from public lighting, the income from gas alone in the year was £78,715, against £74,745—an increase of £4000. In other words, at the lower price, private consumers contributed £6000 more, which cannot be ascribed by the opponents of reduced illuminating power to that cause, inasmach as for nine months 17-candle gas was being supplied. Further, it is a satisfaction to learn that the business is so far this year going on in the same encouraging way. This first experience of the new policy looks as though the Company are not likely to have in the future any cause for regret that they adopted it. As disclosed by the figures already mentioned, the business is far from suffering from the reduction of the illuminating power by 3 candles, which reduction should produce considerable savings, seeing that the Company have to carry coal from Newcastle some 7000 or 8000 miles by sea, and then a further 50 miles by rail to an altitude of 2500 feet. Gas companies at home will be thankful, on this account alone, that their districts of supply are not all San Paulos; and yet out of this Company's book, some of them might profitably take a leaf.

Mr. Bellamy on the Public Lighting of Liverpool.

If there is one city in the United Kingdom which is of peculiar interest to everybody engaged in the supply of gas, it is Liverpool, for within the past decade there has been witnessed therein a gradual reorganization of the public lighting. Of course, that improved lighting in the streets of the city on the Mersey should be called for was only to be expected as a feature of the progress characterizing it. The specially interesting point for gas people is that, while the Corporation have an electricity-supply undertaking in their hands, it is the incandescent gas system that has been favoured for effecting all the improvements which have attracted so much attention. The history of the reorganization of the lighting arrangements of the city, and the extent to which incandescent gas is now employed, are shown in the report on the work of the Lighting Department last year which has just been submitted to the Committee by the City Lighting Engineer, Mr. C. R. Bellamy, Assoc.M.Inst.C.E. The principal portions of the report will be found in another part of the "JOURNAL;" and they will speak to our readers with more force than any remarks we can make in calling attention to, or by way of comment upon, them.

The Gas Bill and Health.

Under this title, the "Lancet" has been making some rather unkind remarks about gas consumers and gas companies, which will perhaps be forgiven in view of the good cause in which they were penned. It is quite true, of course, that the proper use of gas is a matter of importance from the standpoint of health, and it may be the case that very few people know how to so employ it. But it is not so easy to understand our contemporary's assertion that consumers are not helped to study economy by gas suppliers, "who pursue, in spite of the competition threatened by electric light systems, the utterly shortsighted policy of encouraging waste." So far from it being the fact that the Welsbach burner is now encouraged "on the principle that any system is better than none," gas companies have long since recognized that the incandescent light is best for the consumers, and of necessity therefore for themselves. Everything possible has been done by the aid of exhibitions, advertisements, &c., to educate consumers, and by means of maintenance systems to see that they obtain the most efficient light; and yet we are told that "people still go on paying the price of ignorance, while the great gas corporations, in scooping in the price of waste, are blind to the future interests of their industry." If the "Lancet" can tell these corporations what further steps they can take for the furthering of their consumers' (and their own) interests, gas managers will be extremely grateful; but it must at once be stated that nothing short of a thorough periodical inspection of every burner in every house connected with the mains can be of use to consumers who are foolish enough not to know how high to turn the taps of their incandescent burners in order to obtain the best light, or who allow naked flames on their premises to "roar like a blowpipe." And even this would be of no avail if the consumer refused to take heed of what was said to him. The two governing factors of the situation seem to be that the companies are bound to supply gas; and the buyer is free to consume it as he pleases. But to return to the health point of view. The "Lancet" asserts that at least half the incandescent lights in London would, if turned down a little, give a better light, and the same with regard to the flat flames; and on this somewhat doubtful basis it is argued that "the house in which the maximum illuminating effect of gas is secured thus should have the smallest gas bill and the healthiest rooms." In so far as our contemporary's remarks are directed to the people who do not know how to use their gas properly, we are heartily in accord with them; but the strictures passed on the suppliers are not by any means well grounded.

Some Disadvantages of Electricity.

The "Lancet," however, does not confine itself solely to gas. Electricity comes in for some small amount of attention. "The electric light," it says, "has had no effect whatever upon the air; but it cannot be denied that electricity is much more expensive than gas, however economically it may be used; and the supply of electric current cannot be controlled so easily as gas. The electric light cannot be turned down like a gas-light; and hardly anyone understands the principle of an electric meter, while all are tempted to doubt whether it records the truth, and are helpless to decide the question for themselves. In economical households where the electric light is used, care is taken to switch off the current as soon as the light is not needed; and in consequence of this attempt at economy, the greater part of a house is often left in darkness. It is a curious result of electric lighting that many houses have the appearance at night of being tenantless, because only the rooms that are occupied are lighted, and these are often situated at the back of the premises. If gas lighting were better understood, people who are compelled to study economy somewhat closely would find that the use of gas would save them much anxiety." These remarks by so important a medical authority, taken in conjunction with the statement that the vitiating effect of a gas-burner upon the air of a room (assuming that the gas is burning at a minimum rate and giving a maximum light) is practically a negligible quantity, will doubtless carry more weight among would-be consumers of electricity than anything the "JOURNAL" might say would do. It is to be hoped, therefore, that they will meet the eyes of many such persons, and be carefully noted by them.

Councillors and Limited Liability Companies.

In the course of the evidence which he gave last summer before the Parliamentary Committee on "Municipal Trading," Mr. S. Norbury Williams, the Elective Auditor for Manchester, pointed out that while, according to law, a member of a council could not take any benefit from a contract, directly or indirectly, with his corporation, under the now prevalent system of limited liability companies men who desired to trade with their own corporations formed their businesses into limited companies so as to avoid coming within the purview of the strict law. This sort of thing, he maintained, ought to be rendered illegal. A man in such a position should not merely be precluded from trading with his own self, but he should be precluded from trading with a limited company in which he had any serious proportion of shares. Mr. Williams suggested that this rule should be applied to all undertakings, and that the "serious proportion" should be taken to be anything over (say) 10 per cent. of the capital. There is no need whatever to consider the subject from the point of view of any special case; the matter may be regarded simply as one of principle. From this standpoint, it is of interest to note that the question has recently been discussed by the Southampton Borough Council, upon a motion—"That in future no tender shall be entertained by the Council which shall be submitted by any company incorporated under the Companies' Acts, in which any member of the Council shall be interested as Secretary, Chairman, Manager, or member of the Board of

Directors of the company, and that no contract be made with, or employment given to, any such company by, or on behalf of, the Corporation." It will be seen that the terms of this resolution, rigorous though they undoubtedly are, do not in one way go so far as the suggestion made by Mr. Williams, inasmuch as only officers, and not mere shareholders, are included in it. Even this, however, proved a great deal too much for the Council, who rejected the proposal by a substantial majority.

Some Views of Corporation Members.

As this is a subject of which more may be heard, it may be worth while to briefly notice the arguments adduced both for and against the motion by members of the Southampton Borough Council. In the first place, the mover wished it to be clearly understood that the proposition was not directed against any individual councillor, nor had it anything to do with a scandal; his object being simply to give people no chance of saying that members joined the Council to "make," and to show the town they were determined there should be no opportunity of "making." Another reason was that the officials were awkwardly placed in having to criticize goods of firms with which, perhaps, members of their respective Committees were concerned; and while he believed the officials would not hesitate to do their duty, he contended that the Council ought not to put them in such a delicate position. The seconder of the resolution said it was admitted that, under the Municipal Corporations Act, Directors and Secretaries of limited liability companies were allowed to trade with corporations of which they were members; but they consciously or unconsciously placed or exercised an influence on the corporation. Another member pointed out that if the resolution were carried, large firms in the town who were among the biggest ratepayers would be prohibited from having any representation on the Council; and he put forward the very reasonable view that if the members connected with firms or companies interested in any tender were precluded from speaking or voting on it (which, of course, is the case), the difficulty was satisfactorily met. One member thought that if the motion was passed it would frequently debar the Council from accepting the lowest tender; while another denied this, and asserted that the only difference would be that certain gentlemen would have to choose between membership of the Council and their position as Directors. Those who opposed the resolution seemed to think that its adoption would cast suspicion upon all the Council; but there does not seem to be the slightest reason why it should do so. A far stronger argument than this is the fact that such a step, if generally adopted, would result in depriving many big local undertakings of even the small amount of representation they are now sometimes fortunate enough to secure on town and district councils.

The Electrolysis Question at Torquay.

The argument over the electrolysis clause which the Torquay Gas Company obtained the best of in the Commons committee-room has, it seems, to be engaged in over again in the House of Lords. Since the Bill left the Commons with the protective clause for which the Company strove, it has been reviewed by the Counsel to the Chairman of Committees in the Upper House. The result is that certain portions of the Bill have been struck out, including the electrolysis clause. It was reported to the Torquay Town Council last week that the ground for this excision was that a similar clause was excluded in the Beckenham case. But an electrolysis clause has been allowed in many other Bills, so that there are precedents for its admission in the present case. One remarkable effect of striking out the clause at this stage is that it brings the Corporation and the Gas Company into line. The Bill as originally lodged gave protection to the mains of the water-works of the Corporation and of their gas undertaking at St. Mary Church. The Gas Company, in the fight in which the Corporation took only a spectator's interest, succeeded in getting the protection extended to their mains. Now, however, the clause has gone, and the Corporation will be as much concerned as the Company to get it reinstated. There is the more reason for requiring it in the fact that the electric tramway system to be adopted is an almost untried one, and the danger of electrolysis from it is still to be proved.

WATER AFFAIRS.

The Right to Refuse a Supply of Water.

It is not a little curious that, though the General Acts applicable to Water Companies have been in force for a great many years, difficulty is still found in applying their provisions. Clear and explicit as the language used may be, doubts frequently arise in regard to its precise meaning; and the result is that legal decisions given in one place with the utmost confidence in their justness are reversed when the point in dispute is brought before another tribunal. Since the passing of the Water-Works Clauses Act in 1847, one would have thought that there must have been a sufficient number of cases of supplies of water being cut off for non-compliance with certain statutory provisions to furnish precedents governing every possible phase of this difficulty. Yet we find a learned Police Magistrate giving judgment upon a point which a Divisional Court, composed of the Lord Chief Justice and Justices Wills and Kennedy, are unable to dispose of without taking time to consider the matter, as presented to them in an elaborate special case, in the light of the various authorities bearing upon it. These reflections arose on perusing the report of the proceedings taken by Mr. Rodocanachi against the Grand Junction Water Company for "refusing to furnish a supply "of water" to his stables. The facts were simple. A leak was discovered in the communication-pipe leading from the Company's main to the premises; and the coachman was served with notice to have the defect repaired. No attention was paid to the matter by the complainant, beyond advising his landlady; and therefore the Company cut off the water.

It was contended by Mr. Rodocanachi that this was a wrongful act, and that the Company could only justify their proceeding if his conduct in failing to do the repairs was either wilful or negligent, of which there was no proof. Moreover, he urged that he had no power to dig up the public highway, and that he was not liable to repair the pipe—this being the duty of the landlady. The Magistrate sustained these contentions, and convicted the Company in a fine of £6 (being 40s. a day for three days), with £12 12s. costs. Against this conviction the Company appealed, with the result that the three learned Judges already named pronounced a unanimous decision in their favour. The principal points in the combined judgment will be found elsewhere; and therefore it is unnecessary to do any more here than emphasize the one upon which Lord Alverstone laid most stress—namely, that the duty of repairing a defect in a communication-pipe is cast upon the owner or the occupier, and that if he neglects it he lays himself open to the penalty, perfectly lawful in the circumstances, of being deprived of a supply of water. The complainant was ill-advised, it seems to us, to plead that he had no statutory power to dig up the road, inasmuch as the ground was already opened, and the repairs could have been effected with comparatively little trouble—in fact, they were eventually done by the Company's servants, at the request of the landlady, in about two hours. Water Companies are frequently accused of acting in a high-handed manner in regard to cutting off supplies. If there has been any display of this feeling in the present case, it certainly has not been on the part of the Company specially concerned. In an important public service like that of water supply, the consumers have responsibilities as well as the providers; and the more fully this is recognized, the fewer will be the occasions for appealing to the Courts to adjudicate upon questions such as the one to which we have been referring.

The Law as to the Rating of Reservoirs.

It will be seen by the report which appears elsewhere, that the representatives of certain Local Authorities in the Thames Valley who some time ago formed themselves into an Association for Promoting the Equitable Rating of Reservoirs, have not only not lost faith in the justness of their cause, but are receiving encouragement from other bodies to hold firmly to it, and not to relax their efforts to achieve their object. The County Councils of Middlesex, Surrey, and Essex have joined forces with the Association; and a deputation composed of delegates of the various

authorities recently had an interview with the President of the Local Government Board, to plead for an alteration in the law under which reservoirs are rated at only one-fourth of their rateable value. There was a special reason for seeking the assistance of the right honourable gentleman at this juncture, inasmuch as he has promised to introduce an Assessment and Valuation Bill, and it was thought that a clause might be inserted to remedy what is coming to be regarded as a great injustice. The deputation, which was introduced by Sir F. Dixon-Hartland, represented 450 Urban District Councils; and they put before Mr. Long a very plausible case. Reservoirs, as everybody knows who has had much to do with them, are rated as "land covered by "water;" and when they are simply natural lakes utilized for the purpose of supplying towns or villages with water, this is not an inaccurate description of them. But how vast receptacles, composed of earthwork and masonry, on the construction of which many thousands of pounds have been spent, can be regarded in the same light, is to a great many people not easy to understand; and yet they are so regarded by the eye of the law. True, as Mr. Long remarked to the deputation, this may be only "judge-made law;" but there it is all the same, and the difficulty will be to get it amended.

The deputation were unfortunate in the medium they selected for attaining their object. Mr. Long pointed out that the Bill to which reference has been made was altogether unsuitable for their purpose, for the reasons set forth in his reply; and he suggested that they should avail themselves of the Public Health Bill which has also been promised. While acknowledging that the deputation had much justification, as representatives of spending authorities, for the action they were taking, he reminded them that there were other parties, interested in the particular class of property in question, whose views should certainly be heard before any definite promise could be given as to effecting an alteration in the law; and he thought that the best way to elicit these views was to adopt the suggestion he had thrown out, and move an amendment to the Bill he had named. This advice was probably not quite what the deputation expected; but surely it was all a Cabinet Minister was justified in giving after having heard only one side of the case. As the Association are very much in earnest, they will no doubt be on the alert to seize the opportunity, when the Bill is introduced, of renewing their efforts to effect the reform which they consider is so greatly needed. We shall then hear what the Metropolitan Water Board and other owners of large reservoirs have to say in support of a judicial ruling which appears to a good many people besides the authorities represented by the deputation, to be a misapplication of the words of the statute. Mr. Long was very careful not to commit himself to an expression of opinion as to what the intention of Parliament was in sanctioning the use of the words in question when the Public Health Bill of 1875 was under consideration; but if it was that they were to be applicable to structures of the character of those to which reference has been made above, it would be well to have it more clearly specified. This could be done by the adoption of the course suggested by Mr. Long, which would afford Parliament an opportunity of reviewing its former work, and amending it if deemed necessary.

Devonport Water-Works Arbitration.—Arrangements have now been made for continuing the arbitration for the transfer of the undertaking of the Devonport Water Company to the Corporation. The original reference, it may be remembered, was to Sir Frederick Bramwell as Umpire, with Mr. Charles Hawksley and Mr. G. H. Hill as Arbitrators. Unfortunately the award had not been made when Sir Frederick Bramwell died. Mr. A. J. Ram, K.C., has now been selected as Umpire; and it is understood that he will take the report of the evidence already tendered, and then decide whether or not it is necessary to call further witnesses.

The Monazite Sand Contract.—With reference to the leaderette published in the "JOURNAL" for Jan. 12 on the subject of the Monazite sand contract, a despatch has been received at the Foreign Office from H.M. Minister in Brazil, reporting that, as regards the concession granted by the Federal Government to a Russian Jew named Israelson, of Bahia, for working monazite sands in the State of Espirito Santo, which appeared unlikely to be carried into effect, it seems from a paragraph in the "Jornal do Commercio" of Feb. 24 that the opposition against this concession has been temporarily overcome, and that the authorities of the State in question have allowed operations to be commenced in conformity with the terms agreed on. Where are we now; and what about the new invitations for tenders?

THE DEPARTMENTAL INQUIRY INTO LONDON GAS-TESTING AND OTHER MATTERS.

IT is two months now since the Committee appointed by the Board of Trade to inquire into such matters as the testing of gas in London under the changed circumstances of the day and the purification of the gas from sulphur compounds commenced their sittings. As announced at the time, the sittings are being held *in camera;* so that, until the report is issued, there can be no general publication of a *résumé* even of the evidence. At the same time, an indication may now be given as to the progress the Committee have made in hearing evidence bearing upon the reference to them.

The Committee have been sitting for three hours on Mondays and Tuesdays, and sometimes, we rather fancy, on other days. The Referees had the ears of the members at the outset. Professor A. G. Vernon Harcourt was the first witness; and he gave evidence generally on the subject of gas testing. Professor C. V. Boys followed, and spoke on flat-flame burners and other matters. Then Dr. Haldane delivered himself once more of his views on the presence of sulphur in rooms where gas is burned. His evidence, it may be found, was merely a repetition of that given on the Crystal Palace Gas Bill last year, and of his article in the "Journal of Hygiene," which was reproduced in the "JOURNAL" for Sept. 1 last. The Parliamentary Officer of the London County Council (Mr. T. Seager Berry), who succeeded, gave a very fair historical account of the gas legislation for London. Excellent was the evidence which Professor Vivian B. Lewes tendered on the subjects of the portable photometer, burners, sulphur, &c. The inquiry has led the Committee into all the bye-ways of the main questions. Mr. Corbet Woodall and Mr. G. C. Trewby defended the maintenance of illuminating power and carburetted water-gas manufacture, against which, it can be well understood, Mr. H. E. Jones was equally vehement. At two sittings, Sir George Livesey was giving evidence; and if it is said that he dealt generally with everything before the Committee, and particularly with most of the points, we shall not be far from the truth. Important and interesting was the evidence of Mr. Otto Hehner and Dr. Samuel Rideal, who, from their special experiments, were able to give evidence rebutting that of Dr. Haldane regarding the quantity of sulphur present in the air of a gas-lighted room. It is hoped that their experiments settle this sulphur question once for all. Professor Frank Clowes and his usual retinue of witnesses —Dr. Percy Frankland, Mr. Isaac Carr, and Mr. C. R. Bellamy— have, it is understood, all submitted their testimony for the London County Council. The Gas Companies, however, will have the opportunity of appearing again to reply on various points—such as the portable photometer. Dr. Murphy was also one of the witnesses for the Council on sulphur. Mr. H. E. Haward was to be a witness; but we are uncertain as to whether he has been called. The Committee will meet again on April 18, and then a week later. Mr. Charles Carpenter will, we believe, be one of the early witnesses.

This review of the amount of evidence already taken shows that all parties have now been well represented, that the Committee must have almost reached the end of the testimony worth having that the recognized authorities can put before them, and that the members must now be fairly saturated with the subjects referred to them. All things considered, it appears possible that the end of their labours may be reached some time in May or early in June. It will be remembered that upon the issue of their report depends largely the fate in respect of progress this session of the Crystal Palace District Gas Company's Bill.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 40.)

BUSINESS on the Stock Exchange for the week which closed on Thursday—not to re-open till this morning—was naturally much restricted. Things would no doubt have been still more quiet but for the fact of the settlement and the close of the quarter. The general tendency was cheerful; and prices rose to a moderate extent, aided, in some degree, by "bears" purchasing to cover their commitments, though one or two departments closed flat notwithstanding. After the settlement was concluded (not without resulting in difficulties in two or three quarters), many members left for Easter; and for the rest of the week business was at a minimum. In the Money Market, there was a strong demand right up to the close, which was readily met; but discount was quiet, and rates ruled easy. In the Gas Market, the total volume of business did not amount to very much, though at one time a little spurt of activity promised to improve the situation. But despite the quietude, the general tendency was decidedly good, and quotations, wherever they did move, were in the upward direction. One or two issues which have recently been under a cloud effected a recovery; the stock thrown on to the market having apparently been absorbed. In Gaslight and Coke issues, the ordinary was quiet, except on Wednesday, when it developed activity, and was very steady; the figures

marked never ranging outside 87½-88¼. This was practically a repetition of the preceding week. The secured issues were little dealt in, and were unchanged. South Metropolitan was quiet and rather doubtful at first. On Monday, it was done as low as 116; but it recovered the next day, and on Thursday changed hands at 119—the quotation being 1 up. A couple of bargains was all the business in Commercials. The Suburban and Provincial group was almost devoid of business; but Alliance and Dublin new had a rise, and Shrewsbury gained a fractional turn on the *ex div.* adjustment. The Continental Companies had a better time. Imperial commanded prices which justified a two-point rise, and got it; but on Thursday the quotation was rushed up 3 more. Union was disposed to improve, and obtained a jump of 4 up.

The daily movements were: On Tuesday, Imperial rose 2. In Water, West Middlesex advanced 1. On Wednesday, Alliance and Dublin new rose ½, and Continental Union 2. On Thursday, South Metropolitan improved 1, Continental Union 2, and Imperial 3.

ELECTRIC LIGHTING MEMORANDA.

The Mysteries of Electric Light Bills—The Example of Worcester—The Fallacy of Municipalism in Electricity Supply.

It could scarcely have been expected that the business side of electric lighting would be found to furnish any incentive to the gaiety of the nation. But the unexpected not unfrequently happens; and it has come to pass that the professional humorist of the family newspapers has girded himself to make fun out of the maximum-demand system. It is, of course, a serious enterprise; for jokes only come with difficulty when they are called for of set design, especially where the subject is one that touches the most sensitive part of human anatomy—the pocket. We have reason for thinking, however, that the maximum-demand system of charging for electricity supplies has already passed into that region, lying beyond human control, whence all the stock jokes are drawn when wanted for exercise. It is an asylum reserved for subjects in face of which mankind confesses its impotence. There dwells the mother-in-law of the jokist, with most of the other stock subjects of the comic song-writer. The gas-meter once formed part of the furniture of this shadowy place; but it has been lost sight of since the maximum-demand indicator of the electricians attained this distinction. There lies before us at this moment a provincial newspaper, with nearly a column of its "valuable space" occupied with jocular references to the system of charging for electricity just mentioned. Among other flashes of wit, the writer ascribes the modern increase of the number of inmates of lunatic asylums to the rash attempts that are made by householders to "understand the way in which the electric light is charged for." It is a pretty fancy, not destitute of some sort of support, but going rather beyond the facts. The average householder who cares for such things either owns at once that he cannot understand his electric light bills, even while he pays them, or he gives up the attempt—and the light—together. For, after all, there is no obligation upon anybody to trouble himself about such matters. People who get tired of drawing such heavy cheques for electric lighting, literally in the dark as to value received, have an obvious means of escape.

The electricity-supply undertaking of the Worcester Corporation is a singularly interesting example of municipal trading hopes deferred. When the venture was started, in 1895, it was with the design of utilizing a water power by means of a high-tension alternating-current system of supply. There was a combination of steam plant with the water power, for emergencies. But the latter was to be the mainstay of the scheme; and great advantage was expected from the use of electric power by the water-works for pumping. Unfortunately, it turned out that the years immediately following the establishment of the combined plant experienced a shortage of water. When there was water, as last year, there was too much; the turbine plant being flooded out. Consequently, whether there was too little or too much water, the steam plant had to do the bulk of the work. Moreover, the floods came at most awkward times. Eventually the prospect of getting a tramway load led to the installation of a continuous-current plant. Meanwhile, a capital expenditure of £60,000 has risen to double the amount, without any proportionate increase of the earnings. The point of saturation has practically been attained as regards the lighting; and the sales of current to the water-works have begun to fall off. The gross profit, after all these years of effort, is less than £8000 a year, on a capital of £120,650, from which has to be paid interest and sinking-fund charges amounting to £6190. This leaves less than £2000 a year to bear the depreciation on such a large capital, a considerable proportion of which must have gone for vanished assets. The water-power plant and the pumping, to say nothing of the change of system, have claims which no prudent financier of this property could safely ignore. Yet the Corporation dispose of all these troublesome considerations by the simple process of handing over £500 to the general district rate, and placing the splendid sum of £150 to reserve! If this is not hush-money, it would be difficult to find a more fitting term for it. The state of the undertaking is one that the citizens should consider at the earliest opportunity. A structural valuation of the complete plant might be useful. A curious entry in all these electricity supply accounts is that of current "utilized on distribution"—in Worcester, 20 per cent. of the total generated. If this were gas, it would be called waste, or leakage, and not taken as a matter of course.

The statement made by the Chairman of the Metropolitan Electric Supply Company, and repeated by Mr. D. Ford Goddard in the House of Commons, that only one-fifth of the ratepayers in Marylebone take the electric light, has been pounced upon by advocates of municipal supply as an argument for the municipalization of electric lighting. If, they contend, the supply had been in the hands of the Borough Council from the beginning, a very different state of things would have been produced in this regard. So long as such a service is in the hands of companies, with dividends to earn, the "poor man's light" will not be brought within the poor man's reach; and until it is, a far-extending sanitary reform will be postponed. Let us see what this contention really means. As is asserted, the first object of a supply company is the making of dividends; and they must be allowed to know their own business better than any amateur who happens to get elected to a local authority can teach it to them. Therefore, if after fifteen years' working, the Company supplying Marylebone only have a fifth of the number of ratepayers on their books, it is a fair inference that the other four-fifths are not worth having, from the dividend-makers' point of view. Supposing the business to be transferred to the Borough Council, the necessity for making dividends persists, only the funds devoted to this object are entered in the books under a different heading. Not less, but more money must be found for this purpose after the transfer, because the Council have chosen to pay cash down for the good-will of the business. Where is this extra money to be obtained? Evidently not from the less desirable customers whom the Company preferred to go without. It must come out of the rates. The great majority of the ratepayers may not be wealthy enough to indulge in the luxury of electric light; but they will have to pay, according to their ability, for the enjoyment of those who are better off. It is remarked in municipalizing periodicals that "where the undertaking is in the hands of, and any risk has to be taken by, a local authority, the public interest is placed first, and profits in a secondary place." This sounds very fine; but it is impossible to harmonize this noble scorn of profits with the usual contention of the same people, that municipal trading in electricity assists the rates. The truth is, of course, that the municipal apologists want to sit on two stools, and are much annoyed when the inevitable collapse ensues. Yet it is, or should be, clear to a very ordinary capacity, that if municipal electricity is offered at a lower price than a company would charge, and the mains are also carried into places which a company would leave out of the network—which is the usual municipalizers' claim—this difference can only be referred to one of two causes: Either the local authority can work cheaper, or they get a rate-in-aid to defray their trading deficit. With regard to the former, working costs are of two kinds—capital, and on revenue account. Except in the case of a few local authorities who were very early in the field, capital is now no cheaper to them than it is to companies. Nor can the costs of production be less (leaving out the solitary item of directors' fees), when all the working expenses are fairly charged to the business. Therefore, it is impossible to escape from the conclusion that wherever municipal electric lighting is done more cheaply, or is more widely distributed, than by companies, the difference means a loss on the trading account, which must come out of the rates. This is concealed from the public view in all manner of ways; but the fact remains, and must come to light sooner or later everywhere. Marylebone is going to demonstrate it in the plainest manner; and this is the chief reason why the London County Council and the workers of the municipal oracle everywhere wish that this particular Metropolitan Borough were at the bottom of the sea.

Ohio Gaslight Association.—We learn from the "American Gaslight Journal" that the twentieth annual meeting of the Association, held at Cleveland, from the 16th to the 18th ult., under the presidency of Mr. J. D. M'Ilhenny, of Philadelphia (Pa.), was very successful. One of the papers was on the subject of "The Use of High-Pressure Gas for Street Lighting," the author being Mr. J. J. Knight; another was by Mr. W. A. Baehr, on "The Construction and Operation of Recuperative Benches;" while the burning of coke breeze was dealt with by two members. A report on "Uniformity of Gas-Meters" was presented by the Committee appointed to consider this subject; and Mr. H. L. Doherty, the Editor of the "Question Box," submitted his usual compilation.

Cost of Private Bills and Orders.—On the reassembling of the House of Commons next Tuesday, Mr. Herbert Lewis intends to call attention to this subject. He will ask the First Lord of the Treasury whether, in view of the fact that Private Bill Legislation costs the promoters of Private Bills and Provisional Orders, in fees paid to the Houses of Parliament, about £45,000 a year more than the cost to the country of Private Bill Legislation, and having regard to the burden on small urban districts caused by the necessity of obtaining parliamentary powers for the supply of gas, water, electricity, and other public services, the Government will propose a revision of the Standing Order regulating the scale of House fees charged to public authorities in respect of measures introduced by them.

STOPS — NOT SLOTS.

Up to the present time the Company have supplied gas to small houses under what is known as the prepayment system in two ways. In the Croydon district, collectors call each week, and receive payment for the gas which the consumer will require during the ensuing week, setting the meter to pass the quantity of gas paid for. The price of gas is the same as to consumers on the "ordinary" system; and the consumer pays also to the collector a weekly rent proportionate to the fittings he may have elected to hire—that is to say, for meter only, meter and stove, meter and fittings, or meter, fittings, and stove as the case may be. In the Carshalton district, the meters in use are so made that, on a penny being put into them, they will allow a proportionate quantity of gas to pass; the quantity being calculated to represent the price to ordinary consumers, *plus* 9d. per 1000 feet to cover rent for the meter, and the fittings, or the stove which may be supplied. It will be seen that the Croydon system is fairer as between one consumer and another; and, moreover, it admits of a consumer who wishes to hire more than the usual number of fittings, or a second stove, doing so. It also enables a consumer to hire a meter only; and, while not running up a quarterly bill, to get gas at the same price as the wealthier residents in the town. This feature is much appreciated by many of the residents in smaller houses, who, receiving their incomes weekly or monthly and paying their outgoings, including rent, in a similar way, do not care to incur the liability involved in running up a quarterly gas bill. In practice, it has been found that each prepayment consumer in Croydon burns, on the average, more gas than in Carshalton; and in view of this, of the advantages of the Croydon system to which I have alluded, and of the greater popularity of the Croydon system among consumers, the Directors have decided to introduce it into the Carshalton district, and to discontinue the supply of gas on the coin-slot system.—*Extract from the Address of the Chairman (Mr. Charles Hussey, J.P.) to the Proprietors of the Croydon Gas Company at their last Half-Yearly Meeting.*

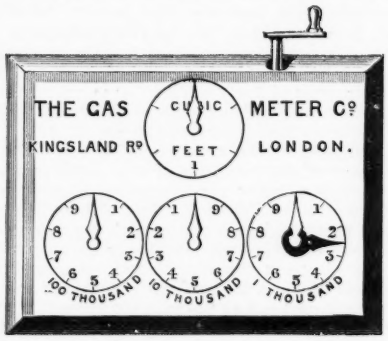
Stop meters or slot meters? That is the question the Croydon Commercial Gas Company have, it will be seen from the above, answered to their own satisfaction, to the end that, in a short while, ordinary slot meters (excepting, if the scheme is carried out, under a special stipulation of the London County Council, in their workmen's dwellings at Norbury) will have no further part in the gas enterprise of Croydon, but their place will be filled—with, it is maintained, greater advantage to both consumers and Company—by the system that has received the largest adoption in the area of the latter, under circumstances which will be dwelt upon in the course of this article.

Now when a Company of the condition and with the record of that at Croydon arrive at the determination, at this time of day, to abandon entirely for ordinary use the slot system, there must be reasons for such a course which are worth plumbing in the interests of the gas industry at large—more especially when the quality of the management upon whom reposes the responsibility for the decision, is taken into consideration. The constitution of the Board is an excellent one, with special gas experience strongly pervading it; while (it is almost superfluous to say it) the General Manager and Engineer is Mr. J. W. Helps, and he has a zealous adherent in this matter in Mr. W. W. Topley, the Secretary. They, in fact, it was who—on the strength of an incontrovertible personal experience, supported by the testimony of the prepayment system staff and the consumers themselves—initiated the change last September that has been ratified by the Directors, and which will assimilate the prepayment system in Carshalton to that long in vogue in Croydon proper. The personal element alone, in fact, is a guarantee that the reasons for the eviction of slots from Carshalton and the installation there of the Croydon stop system are good and all-sufficient. Mr. Hussey's pronouncement on the subject (as quoted above) only gave an inkling as to the nature of these reasons, and that was enough for a meeting of shareholders. But, for the gas profession and his fellow gas administrators, his explanation stopped short just where they would have desired him to proceed, by submitting for their consideration the solid facts that were only adumbrated in his speech. However, the deficiency from their point of view can now be rectified through the kind compliance of Mr. Helps with a suggestion that he should furnish a representative of the "Journal" with the necessary material for the purpose; and in doing this, he was heartily assisted by Mr. Topley. What is stated in these articles may therefore be taken, not as a statement of any argument of our own, but as the presentment, by a member of the "Journal" staff, of the Croydon case for the cash-in-hand system of prepayment as distinct from the cash-in-the-box, or slot-meter, system. This manner of describing the systems at once points to one of the asserted advantages of the former over the latter.

The decision of the Croydon management has not been arrived at hastily. It is the effect of an accumulation of evidence solely from within the Company's own domain; and with a larger experience of the preferred system than is found in any other town (save perhaps in Ramsgate). It was, in fact, in Ramsgate that the stop meter that (in an improved state) has proved so successful in Croydon was invented by Mr. W. A. Valon, and which has ever since—it must be now some sixteen years ago—been manufactured by the Gas-Meter Company, Limited. One or two other makers, it is believed, have introduced, or are now introducing, competitors in the same class.

One may be pardoned for turning aside from Croydon for the moment to touch briefly on the point as to why a system that has had such highly gratifying results there has not been more generally adopted. Soon after the meter was invented, it was introduced, by the makers mentioned above, to the gas industry from north to south and from east to west of the country; but at the time the industry was not ripe for a prepayment meter of this character. The prevalent idea was that too much trouble would be occasioned by the setting of the meters, and other objections which will be dealt with in relating the experiences of Croydon were prolific on all hands. In the initial stages of the system, when its application might have been sparse in a district, the trouble and disadvantages that were feared might have obtained. The slot meter offered a means of surmounting these infantile troubles; and perhaps on that one account more than any other, the slot system quickly took deep root—it was favoured, nursed, and pushed, and the other system ignored save by the one or two engineers—and it has, it must be confessed, flourished exceedingly. But the times have changed; and, taking the conditions as they exist to-day—when sparseness of adoption has grown, and is continuing to do so by huge strides towards (where the ordinary system cannot be applied) universal installation and use—the question may be asked, which system, stops or slots, is the one that, all things considered, is preferable? Ramsgate must be left out of consideration, as well as Enfield and Barking where a few stop meters have lately been put in experimentally, as inquiry has been limited to Croydon; and in Croydon a very decisive answer has been given to the question. This, if any excuse were needed, is a sufficient reason for entering into their experiences in detail. Interest envelops the subject; and therefore every possible point may profitably be dwelt upon.

It may be that, in view of the limited experience with the stop meter, there are even gas engineers who are unacquainted with the principle upon which it acts and is worked. The meter is designed to give to the consumer the quantity of gas for which he places cash in the hands of the collector, and then to cut off the supply as soon as the quantity contracted for has been consumed. [It will be shown that, by the system practised in Croydon, it is a rare occurrence that a consumer is left without a supply.] The index of the meter has an additional hand which is called the



The Dial of the Stop Meter.

Showing the Stop-Hand and the Collector's Key in position. It should, however, be stated that at Croydon the key used is a straight one, and not of the crank-handled type shown, as it is found that the latter is more likely to upset the mechanism with rough usage than is the former.

stop-hand. This stop-hand is adjusted by means of a key carried by the collector, and cannot be turned backwards. It is in connection with a disc or clutch and pin, whereby, when the registering pointer has arrived at a position coincident with the stop-hand, the stop action takes effect, and the meter ceases to pass gas. For 3-light meters, the stop action is connected with the first or hundreds dial; but the invention, which is equally adapted for larger sizes (as in the case of a 20-light one just sent out to Colombo for cooking purposes), can be applied to either of the other dials, and thus admit of prepayment being made for a large quantity of gas. But supposing a consumer requires to pay for 200 cubic feet of gas, the stop-hand is placed on the 2. When next the collector calls, there may be a balance of gas to the consumer's credit, but he desires to pay for a further 200 feet. The stop-hand is then turned on to the 4. Should the ordinary dial hand reach the point of coincidence, the supply of gas would be shut off. One of the improvements since the original meter was introduced has been in the valve arrangement, which allows the gradual shutting off of the meter when (if ever) the supply reaches within, say, 5 or 10 feet of the quantity paid for.

The Introduction of the Stop Meter in Croydon.

With the foregoing introduction and explanations, the experiences of the Croydon Company with the stop meter in their old area and with the slot meter for eight years in the Carshalton district may be recounted. Turning over his records, Mr. Helps lighted on an interesting report which he made to his Directors in 1889 on the possibilities as he then saw them existing for developing the Company's business. This report was the harbinger of the stop-meter system in the borough. Read with the knowledge of what has since happened, the report of fifteen years since has a peculiar interest. Mr. Helps then recognized that the increasing business of the Company was due rather to the larger quantity of gas used by the then consumers for purposes other than lighting than to the spread of the use of gas as an illuminant. But,

he said, "it cannot be urged that there is no room for an increase in this direction; for at present [1889], out of about 16,500 houses in the Company's district, gas is used in only about 6000, leaving 10,500 upon which to work." He pointed out the reality of the competition that then obtained through the improvement in oil-lamps in the domain of lighting, and the trifling extent of the realization on the part of gas suppliers that "they must enter into active and commercial competition with rival purveyors of illuminants." The hindrances in the way of adopting gas lighting in the smaller class houses were enlarged upon; and this led up to the following suggestion: "That the Company should offer to supply and fix the necessary pipes and fittings to any house of a certain size, from the occupier of which an application had been received—of course, upon the fulfilment of certain conditions. The cost of doing this, including a 3-light meter, one pendant for the front room, one for the back room, one bracket for the kitchen and another for the passage (all burners being governed), would be about £3 10s. A sum of 8s. per annum would cover the rental of the above fittings and meter, and would necessitate a weekly charge of 2d. per week, or 8d. a month." There were other proposals as to the addition of a cooking-stove, &c.; and a suggestion that the accounts should be collected monthly or weekly. Then followed this reference to the Valon stop meter: "Lately a very simple contrivance has been invented by Mr. W. A. Valon, of the Ramsgate Gas-Works, which promises to fulfil all requirements. Should this be borne out in practice, I would certainly recommend that meters of this description should be adopted in place of the monthly or weekly collections mentioned above." An experiment on the lines indicated, it was suggested, should only be made on 100 or 200 houses. To-day Mr. Helps confesses that if there had been in 1889 a perfect slot meter, he should have recommended its adoption in preference to the stop meter; to-day, too, he is rather glad than otherwise that there was not such a slot meter to lead him from the road which he then took, and which has proved to provide such comfortable travelling for all concerned.

Progress of the Stop and Slot Systems.

However, the stop meter was adopted; and to the stop meter the Company have adhered in their old district. They have never taken any serious steps to push it. In the first place, they sent out a circular to the residents in a few streets that were considered suitable for a trial. Then they went further afield, until now the system has spread all over the borough. It has never been forced for the purpose of getting a rush of connections. It has had a gradual, natural growth on its own merits, and at a sufficiently rapid rate, in the last decade, to satisfy the Company, as will be seen by the accompanying tabulated statement.

Before giving this, however, it should be explained that in 1894 the Carshalton Gas Company were taken over by the Croydon Company. In the Carshalton area the then comparatively modern system of prepayment supply had not taken root. But within the succeeding two years, notwithstanding the success of the stop-meter system in Croydon, it was determined to give the district over to the slot meter, so as to try the two systems side by side, under the one management. This was done. It is sufficient comment on the experience—pointing, as it does, the result of the comparison—to repeat that the "slots" are now being deposed by "stops," to the advantage of the Company, and to the satisfaction of all concerned—officials, prepayment staff, and consumers alike. It was on Nov. 25, 1889, that the stop-meter system was introduced in Croydon, and on June 6, 1896, that the slot-meter system was introduced in Carshalton. Croydon, as the meters fixed show, is a far different place from what it was when Mr. Helps reported to his Board in 1889; and just as his reflections of that year on the apathy of gas suppliers in connection with the lower levels of custom would not apply to Croydon now—true though they were then—they would not have the same general application to-day.

Growth of the Number of Consumers in the Croydon Company's District.

Year ending December.	Ordinary.	Stop Meters. Croydon.	Slot Meters. Carshalton.	Total.
1889	6,270	21	—	6,291
1890	6,460	135	—	6,595
1891	6,610	301	—	6,911
1892	6,781	522	—	7,303
1893	6,965	791	—	7,756
1894	7,731*	1,138	—	8,869
1895	8,156	1,499	—	9,655
1896	8,346	2,219	81	10,646
1897	8,729	3,097	208	12,034
1898	9,286	3,697	278	13,261
1899	9,686	4,539	379	14,604
1900	10,110	5,394	497	16,001
1901	10,633	6,247	607	17,487
1902	11,208	7,310	719	19,237
1903	12,030	8,548†	757	21,335

* Includes 645 transferred from the Carshalton Gas Company.

† Includes 110 Carshalton District stop consumers; making the total of stop and slot consumers in Carshalton 867.

*** The numbers given as ordinary consumers do not represent private consumers alone, but include secondary supplies—such as greenhouses, stables, gas-engines, workshops, public offices, business premises (apart from residential premises), schools, railway stations, signals, &c.

The development in the stop-meter system shown by this record proves conclusively that, from the consumer's point of view, it can have no inherent disadvantages; on the contrary, it will be seen as the articles proceed that it has several points about it that rather appeal to their fancy.

Terms and Conditions for a Supply of Gas under the Stop System.

The system practised by the Company is to have a fixed rent of 2d. or 3d. per week for standard installations; and to charge through the stop meter for the gas *at the price paid by ordinary consumers*. The flexibility of this sytem is one of its advantages. Beyond the standard installation, a consumer can have anything required—a cooker, a gas-fire, or an increased number of lights—at an agreed extra rent. The whole of the rent is collected weekly with the amount to be paid for the gas ordered at the time by the consumer. For the amount so ordered, the meter is set beyond that which may still be to the credit of the consumer. It will be recognized that there are matters in this short statement of the system practised that are of great importance; and they will be dealt with more fully later. Meantime, as it is intended to make these articles as complete as possible, the actual terms and conditions on which a supply of gas is given under the stop system at Croydon may be quoted.

APPLICATIONS FOR GAS are to be made on a printed form, which is supplied by the Company, and where the mains of the Company exist in the road, opposite the premises to be supplied, and provided the Company's collectors are able to call weekly at the said premises, the Company are prepared to supply gas, subject to the provisions of the Company's Acts of Parliament, and to the following Terms and Conditions:—

COMPANY'S EXPENSE.—The Company will provide and lay a service-pipe, free of charge, if the distance from the main-pipe to the *inlet of meter* does not exceed 100 feet, and will keep the same in repair.

CONSUMER'S EXPENSE.—The Company exercise the right to determine the size, and the position, of the service-pipe and the meter, and to provide and lay any additional service-pipe beyond the 100 feet referred to in the last paragraph, charging a contribution towards the expense to the consumer, according to the following schedule of prices—viz., 1-inch wrought-iron pipe, 6d. per foot lineal; 1¼-inch, 7d.; 1½-inch, 9d.; 2-inch, 1s. Bends, tees, and connections at the *same price as one foot of the pipe*, according to the size. The amount of such contribution must be paid before the work is commenced.

THE SERVICE-PIPE, from the main-pipe to the inlet of the meter, is the property of the Company. All fittings on and beyond the outlet of the meter are to be done by, and at the expense of, the consumer; the Company not being responsible for leakage of gas from, or repairs to, such fittings.

MAIN-TAP.—A main-tap will be provided, and kept in repair, by the Company.

METER.—The Company will provide this at a rental of one penny per week, and will keep it in repair.

CARE OF METER AND FITTINGS.—The consumer will throughout the hiring take all reasonable care of the meter, pipes, and fittings the property of the Company, and will be responsible for their safety, and in case they or any of them shall at any time during the hiring be damaged through fire or other accident, or from wilful damage or carelessness, the consumer will on demand pay the Company any loss which they may sustain thereby. The Company shall not, at any time during the hiring of the said meter or fittings, be liable or responsible for any loss or damage which may be caused by or through the use of the same or any defect therein or in any pipe, tap, or fittings belonging thereto or in connection therewith.

CONNECTING OR REMOVING METERS.—No meter is to be connected to, or disconnected from, the Company's pipes, unless by the authorized workmen of the Company.

PRICE OF GAS.— per 1000 cubic feet until notice by the Company fixing a different price within the limits fixed by their Acts of Parliament.

SUPPLY OF GAS ON PREPAYMENT SYSTEM.—Gas will be supplied under this agreement through the meter known as the prepayment system meter in such quantities as may be agreed upon between the Company and the consumer as hereunder stated; and the consumer shall pay to the Company's collector in advance the price of all gas so supplied, together with the rent for the meter and fittings for not less than one week in advance; and the consumer shall not be entitled under any circumstances to a supply of gas beyond such quantity of gas as may pass through the meter as set by the collector on such payment being made.

NOTE.—The meter is so arranged that the collector can set it to allow any agreed quantity of gas to pass, and the collector will, not more often than once a week, as may be arranged between the collector and consumer, so set the meter on being paid as aforesaid as to pass any unused quantity previously purchased and the further quantity so paid for; and the collector will, on so setting the meter, leave a signed statement showing the quantity which the consumer is entitled to consume and the amount paid.

IRREGULARITIES IN MECHANISM.—In the event of it appearing from the meter, or otherwise, that the mechanism regulating the prepaid supply of gas has allowed more gas to pass than the quantity paid for, the consumer shall on demand pay to the Company at the current price for such additional quantity, as shall be shown by the meter to have been consumed.

REGISTER OF METER.—The register of the meter shall be *prima facie* evidence of the quantity of gas consumed; but should the correctness of the meter be disputed, it shall be officially tested by the London County Council, whose certificate shall be final and conclusive. Should such official testing show error in registering the consumption of gas, the percentage of error shall be added to, or deducted from, the consumption for the period in dispute, but for that period only. Should the meter cease to register the quantity contracted for, the quantity supplied will be estimated by the Company on the best available evidence. The Company's charge for having a meter tested by the London County Council is three shillings, which must be paid previously to the removal of the meter, but will be returned if the meter is found to register in favour of the Company.

RECEIPTS.—Official receipt books are provided, and every receipt should be torn therefrom, and have a distinctive number; attention is particularly called hereto, as no other receipt will be valid. It is not advisable to destroy these receipts.

REMOVAL OF METER.—The Company shall be entitled at any time and for any cause upon giving seven clear days' notice in writing to determine the agreement and to remove the meter. The consumer may at any time give notice to have the supply discontinued and the meter removed; such notice must be in writing and delivered at the Chief Office of the Company, Katharine Street, Croydon; and the consumer shall be responsible until the expiration of one clear day (exclusive of Sundays and Bank Holidays) after the delivery of such notice for all gas supplied through the meter, and for the rent of the meter and for all damage done to the meter and any stoves or fittings, the property of the Company.

[*Here follows a "Caution" as to damage and access to meters.*]

TERMS AND CONDITIONS for fitting up Houses of a Rental not exceeding 14s. per week, inclusive of Rates and Taxes, with Gas Pipes, Fittings, &c., at the expense of the Company.

Before the fitting up of any house is commenced, the forms [annexed] must be signed by the applicant and the owner respectively; the latter giving his consent and his acknowledgment that the gas pipes, meter, and fittings are the property of the Company, and not liable to seizure under distraint for rent.

The fittings will be of uniform pattern, and can be selected from the following—viz., Wall brackets, single pendants, double pendants, and harp pendants, subject to the fittings and the respective positions selected for the same being approved by the Company's inspector, and the rents payable will be according to the following scale:—

FOR TWOPENCE (2d.) per Week. { A prepayment system gas-meter and one, two, three, or not exceeding four fittings, also a gas boiling ring or griller (if required) with the necessary internal pipes, &c.

FOR THREEPENCE (3d.) per Week. { A prepayment system meter and five or not exceeding six fittings, also a gas boiling ring (if required) with the necessary internal pipes, &c.

Note.—The Company do not supply an extra fitting in substitution for the gas boiling-ring, nor do they supply more than six fittings on hire to one consumer.

SALE OF FITTINGS.—The Company are prepared during the hiring to sell the fittings and pipes to the consumer at a price to be named by them. On such purchase the rent for the fittings will cease; and the consumer can either continue to receive a supply of gas on the prepayment system (hiring a meter only), or arrange with the Company for a supply upon the ordinary system.

GAS-STOVES, &c.—The Company also provide and fix free of charge (on conditions a copy of which may be obtained at . . .) certain gas cooking and heating stoves at rentals of from 2d. per week per stove payable in advance.

The question of the advantages of the stop-meter system has yet to be taken in hand; and it affords an abundance of interesting material. It is certain to be the case that this opening article will raise several points in the minds of readers upon which information will be desired; and it may be found that what is to succeed will satisfy that desire. This is said in order that Mr. Helps may be put to no unnecessary trouble through his and Mr. Topley's kindness in placing the Croydon experiences with the stop-meter system so completely at our disposal, for the benefit of the industry generally.

(*To be continued.*)

COMPARISON BETWEEN ELECTRIC MOTORS AND SMALL GAS-ENGINES.

WHILE representatives of the electric lighting interest are anxiously awaiting the appearance of a new lamp able to compete, on better terms than the old ones, with the incandescent gas-burner, they are not at all easy in mind about the prospects of the small electric motor, in face of the competition of the gas-engine. It is well known, as a matter of fact, that beyond a certain small connection, which (like the cream of the lighting) can be picked up for electric power in most places, the trade in these appliances does not grow. The reason for this is that, when it is a case of more than 8-horse power or thereby, the cost of the electric power mounts up very unfavourably in comparison with the gas-engine working with ordinary gas. The facts have recently come out very clearly in correspondence in the "Electrical Review," which we quote because it is of advantage to follow the statements of competitors. The discussion started with an editorial article in the issue of our contemporary for Feb. 26, in which it was admitted that "gas-engines under favourable conditions are certainly economical as a source of power, and it is often very difficult to persuade users to abandon them in favour of an electric motor." This difficult and painful task is being essayed by the writer of the article, in a town where the gas-engines in use aggregate 600-horse power. It would be a serious loss to the gas company concerned if this enterprise were successful; while, of course, if they should be obliged to give up the struggle on the merits, the effect would be disastrous for the gas industry generally.

It is, therefore, well to see how the attack is being conducted. We are told of an "actual case," which is put forward as a "fair sample," taken from a considerable number almost exactly similar. The horse power, average load, price of gas, &c., were all given by the user, who was quite satisfied with what he was getting for his money. There is a 14-horse power gas-engine in a joiner's shop, believed to work at half-load for 48 hours per week, or an equivalent of 7 brake horse power for 624 hours quarterly. The actual gas bill is £5 10s. per quarter, with gas at 2s. 6d. per 1000 cubic feet. "A brief calculation shows that, for the load and hours stated, electricity at 1½d. per unit would cost £25." This difference, to the ordinary man, would bear the interpretation of the electric power being out of it, even at the losing quotation mentioned. The sanguine electrician, however, is not so easily dismayed. He sets to work, and (on paper, at any rate) satisfies himself that the gas-engine is sadly overrated. Assuming the gas consumption at half-load as 30 cubic feet per brake horse power, he arrives at the conclusion that the gas bill ought to amount to £16 7s. per quarter. Correcting the power used by the actual amount of the bill, he finds that the engine cannot be doing more than one-third of the work credited to it. Hence it runs two-thirds of its time idle. This cuts down the proportion of useful work done per quarter to 775 brake horse power. Next, the cost of running the engine has to be corrected. To the bare amount of the gas bill—£5 10s.—is added the cost of a quart of cylinder oil a day, at 1s. per gallon—19s. 6d. Bearing oil and waste, repairs, attendance, cleaning, and miscellaneous expenses, easily swell the cost to £9 1s. per quarter, which, divided by the useful work done, comes out at 2·85d. per brake-horse-power-hour of such work.

This is, really, not so bad a showing after all. But it helps the electrician wonderfully; for he immediately assumes that the same work can be done by a polyphase induction motor, with current charged at (say) 1½d. per unit. The motor is to work with an efficiency of 82 per cent., and care is to be exercised in switching it off when not required. This makes the cost of current, for 775 brake horse power at 1·32d., amount to £4 5s. Adding a few small items, for oil, repairs, and contingencies, the amount of the bill comes to £5 0s. 6d., or 1·555d. per brake-horse-power-hour. "The saving due to electric power is, therefore, £16 2s. per annum, or 44½ per cent." Prodigious! It is observed that interest, depreciation, &c., are neglected in both cases, "as it is a question of exchange and not of first choice, and therefore does not appeal much to the consumer." Is it to be inferred, consequently, that in this particular instance the electric power supply company or the local authority are prepared to make the exchange without cost to the user? Otherwise, obviously, the consumer has to pay the difference between what he can get for his old gas-engine and what he has to pay for the electric motor. The writer does not complete his story by certifying that the user of the gas-engine was equally convinced with himself as to the validity of his comparisons, and gave effect to his opinion by abandoning the old love for the new fancy.

No sooner did this somewhat ambitious article appear in our contemporary, than the writer's assumptions were challenged from all sides. Mr. H. Mensforth (London) wrote to point out various mistakes, not on one side only. Citing the example of an 8-horse power gas-engine driving the tools for a small engineer's shop, it was brought out that the cost per brake horse power was 1·27d. per hour for gas, and 1·4d. for electricity at 1½d. per unit—supposing, that is to say, that current is purchasable in such a small quantity at the price named. Mr. G. A. Hibbard (Manchester) poured ridicule on the original estimates; declaring that anything like a 14-horse power modern gas-engine would not take more than 18 cubic feet per horse power at half load, or 15 cubic feet per brake horse power at full load. Another critic observes that if the writer of the original article is unable to make out a better case for electrical driving than the example given, his chances of displacing the 600-horse power of gas-engines are but small. Yet another critic, Mr. James S. Wylde, points out that of all the figures used in the calculation in question only one—the quarterly gas bill—is a fact obtained from actual practice. All the rest are assumed; and the result is therefore hypothetical. The comparison is entirely vitiated by the assumption that the power is only wanted for a short time—one-third of the actual period of running—and that the electricity to supplant it would be used in the same way. That is not the way in which the work of a shop is done. Obviously, if only one small tool were kept running all the time, the calculation would be upset.

On the actual facts, however, of the working of small joiners' machinery, Mr. Wylde makes the following comparison: The electromotor was rated at 460 volts, 40 amperes. The bill for current amounted to £54 9s. 5d. for the quarter ending March 19, 1903. The charge was less than 2d. per unit. This motor was replaced by a gas-engine to run the plant in the same manner; but it was bought much larger in view of extensions. Consequently, it ran at a disadvantage, being underloaded; but the cost of gas for the first quarter, at 2s. 3d. per 1000 cubic feet, was £20 5s. 5d. The comparison per week was, therefore: Current average, £4 19s.; gas average, £1 13s. 9d. The gas consumption since has been slightly less, as might have been expected after the engine had had a few months' use. Though Mr. Mensforth questions the accuracy of this statement, as regards the efficiency of the gas-engine at an underload—it works out to a gas consumption of 19 cubic feet per brake horse power per hour—it can hardly be sustained that the criticism is a very damaging one. Any criticism that may be brought to bear upon the electrical estimates must be more severe, if any regard is had to facts of experience. Few companies or local authorities offer small supplies of electric power at a lower rate than 2d. per unit. And there is another consideration, which would-be users of electric power must reckon with—motors must never be overloaded, for fear of a short-circuit. Consequently, in practice, they are always run considerably underloaded, which is greatly against their efficiency; so that the user pays for a good deal more electricity than he employs. The first outlay on an electric motor, with starting-switch, cut-outs, and the wiring—to say nothing of

the meter—is comparatively large. In practice, it is found that only new factories, in connection with which it is a point of honour to show "all the latest improvements," take to electric driving; and even here it requires all the adventitious gains of increased output, absence of heat and belting, &c., to make the electric power compare favourably with gas power. The number of moderate or large sized gas-engines in good condition superseded by electric motors is small, for reasons that are plainly given in the foregoing statements.

GAS-ENGINES FOR RAILROAD WORK.

Special numbers of the "Engineering Magazine" are being devoted to a series of illustrated articles on labour-saving by power applications. The first one has been issued; and though it does not specially touch upon the question as viewed by the gas maker, there is a considerable amount of matter and illustration brought together in the number which will not appeal in vain for the interest of engineers in all branches.

Towards the close of the number, in the customary review of the engineering press, an abstract is given of a paper by Professor W. T. Magruder, before the Central Railway Club, in which he described the use of gas-engines in railroad work—in shops, yards, and pumping-stations. The subject is of importance, as railway companies at many points of their systems are large users of power locally; and it may be profitable to examine the reasons put forward by the Professor for the extended use of the gas-engine in various departments of railroad work in America.

The earliest use of the gas-engine in railway service was in connection with pumping-stations, especially for isolated points where skilled attention could be given only intermittently. Such engines may be started in the morning by the station agent, or by a track-walker, and left running until stopped by an automatic appliance when the tank is filled, or stopped by the same attendant at the end of the day. As Professor Magruder points out, however, such gas-engine pumping-plants have been used almost entirely for small installations; the opinion prevailing among railroad men that steam is preferable for larger plants. The development of the large gas-engine, however, is extending to railway service, and in some instances a gas electric power system has been introduced; the power being transmitted electrically to pumps at a distance.

In some cases gasoline is used in these plants; but if the plant is such a large one that the services of a pumper are constantly needed, a cheaper fuel than gasoline should be used, and either a suction gas-producer or an oil-gas producer should be installed. By this means, the total cost of operation can be reduced by the difference in the cost per horse power of the coal used in a boiler and the coal or oil used in a producer.

Many vexatious and expensive repairs can be prevented by the installation of an engine and pump of high grade. In this, as in many other lines of industry, the machine lowest in first cost is not necessarily the cheapest. A certain number of parts are needed in every engine or machine; and the builder who saves the purchaser the expense of a few dollars by omitting these parts, frequently causes him to spend several times the amount so saved in extra fuel required and in more frequent repairs. On the other hand, the best engine does not necessarily have to have an excessive number of parts, and usually such an engine is liable to easily get out of order. Each part of a gas-engine or other machine should have a definite object for its existence, and a definite duty to perform, for which it should be suitable in both strength and material.

The installation of gas-power plant at a railway station will be accompanied by numerous opportunities for the replacement of hand labour by power. Thus, turntables are readily operated by electric motors, while coal-handling, rock crushing, and the like are conveniently done. The operation of swing or draw bridges may be greatly facilitated by an available source of power, and numerous local applications will suggest themselves. The success, too, of internal-combustion motors for propelling automobile vehicles has indicated their application to motor and inspection cars; and such machines are coming into use.

In addition to any special applications, there is every reason to believe that the gas-engine is well adapted for use in connection with central power stations and railroad shops. Here the fuel economy plays an important part, since modern gas-engines fairly rival the steam-engine in running qualities, while a gas-engine of medium size is as economical of fuel as the largest and most completely equipped triple expansion steam-engine. Some of the advantages of the gas-engine for central stations are: Minimum fuel consumption; low cost of operation and maintenance; simplicity of equipment, only two auxiliaries required (an air compressor for starting the engine and a magneto, or dynamo, for producing current for electric ignition); quick starting; no "standby" losses; the light load efficiency is superior to that of the steam-engine; the waste heat of the jacket-water and of the exhaust gases can be used for heating buildings; no danger from explosion; energy can be stored during light loads in one or more gasholders at less cost than by any other means; the greatest efficiency does not demand the use of the largest possible units; and hence the subdivision of the power among a number of smaller units gives better economy.

For railroad work it is possible to erect either coal-gas or water-gas producers, and to use the product in gas-engines for generating electricity, either at central stations or at different points around the shops and yards. The water gas could be carburetted for illuminating purposes, if desirable. The railroads, says Professor Magruder, might be able, in the light of recent experiments and experiences, to convince the managers of city gas-works that it was to their interest to increase the amount of coal gasified in their present works, so as to furnish more gas for use in gas-engines by the railroad company, and at a rate which would make the net cost of power when so generated much less than with steam power.

THE "HUMPHREY" LIGHT.

The "Humphrey" gas-lamp is an importation from America, where, the statistics to hand show, it has received a remarkable adoption, extending to over six figures. Kalamazoo was the birthplace of this lamp, which bears the inventor's name. It was first introduced generally to the notice of American gas engineers in a paper read by Mr. J. J. Knight, before the Michigan Gas Association in 1901. From this paper, we have selected the following passages as being of interest in conjunction with the introduction of the lamp into this country by Messrs. J. & W. B. Smith, of Farringdon Road, E.C.

> Fortunately for us there is a gentleman in our city [Kalamazoo] by the name of Humphrey, who is a mechanic and inventor of the first order, and who has been working for years on gas appliances. We interested him; and after much labour and many experiments, changes, and improvements, he has produced a light which dispenses with chimneys, and the accompanying nuisance of almost instant clouding, burning, and breaking; a light that dispenses with all air-shutters and their careful adjustment; a light that will not carbonize or strike back; a light in which the mantle fits the flame and the head of the burner, and in which there is no inner cone to the flame, with its imperfect combustion, and in which the gas does not have to burn through the mantle some distance to obtain air enough for its perfect combustion because it is properly aerated before it reaches the point of ignition—thus giving a perfectly non-luminous flame, and a light from which we are getting 100 candles from each mantle.

The lamp described, in different forms for various purposes, is the one that Messrs. Smith have brought to notice. It is a four-light cluster lamp, made with a central gas-supply tube, to which the burners are connected at the bottom. At the top is a 16-inch opal ceiling-plate; and fixed just above the opalescent (alabastrine) globe surrounding the burners is a 17-inch opal reflector. It is to the burners and to their action and effect that attention is drawn by those interested in the lamp, as being the seat of its high performance. The burners are of special construction, and elongated, which, it is explained, causes them to create their own draught, and ensures complete mixture of the gas and air. The importance, asserted by considerable experience, of obtaining a perfect commingling of the two is being recognized more and more by makers of incandescent burners and lamps. Beyond this, the grouping of the burners in close proximity to the supply-pipe causes the gas to be superheated, which "greatly expands the gases, increasing the temperature of combustion, and effecting a greater economy and increased efficiency." Chimneys are dispensed with entirely; and the simplicity of the whole of the parts of the lamp (which simplicity can be appreciated at a glance) makes it clear that here there is little, with moderate attention, that can get out of order. In one form of the lamp, the burners are—being filled with pilot-jets—lighted by means of a special arrangement of cock and chains operating a spring valve. It is exceedingly useful, in several circumstances, with a lamp of four burners and mantles, and of the high illuminating power of this one, to be able, in the interests of economy, when the full lighting capacity of the lamp is not required, to extinguish a part. In this case, by simply pulling the chain connected with the cock half-way down, one burner is ignited; by pulling the chain fully down the four burners are set going. There is a second form arranged for all burners to be on, or all off. Another feature of the burners is that the tops have to be merely lifted off for cleaning purposes.

The claim made for the intensifying of the light by the heating of the gas appears to be corroborated by the fact that, starting cold, there is, to the eye, an appreciable accession of incandescence of the mantles after the lamp has been in use a short time. The average consumption of gas by the lamps, which would vary a little according to quality and pressure, is stated at 14 to 15 cubic feet an hour, and the resulting light at from 425 to 500 candles, which is equal to (taking the higher figures) about 33 candles per cubic foot of gas consumed. This must be described as excellent, particularly in view of the fact that there is nothing beyond what has been explained to account for such a high duty. Anyway, judged only by effect, the light is steady and powerful; and a good diffusion is obtained.

The "James Forrest" Lecture.—The twelfth "James Forrest" Lecture will be delivered at the Institution of Civil Engineers on Thursday, the 21st inst., by Mr. Dugald Clerk, M.Inst.C.E.; the subject being "Internal Combustion Engines."

OBITUARY.

The death took place last Tuesday of Mr. WILLIAM FOWLE, the Chairman of the Folkestone Gas Company. The deceased gentleman, who was 72 years of age, took a prominent part in the earlier stages of the Volunteer movement.

PERSONAL.

Mr. W. JONAS, the Outdoor Foreman of the City of Waterford Gas Company, has been appointed Manager of the Carrick-on-Suir Gas-Works.

Mr. J. C. ARCHER has retired from the position of Secretary to the Bridlington Gas Company; and Mr. JOHN KELLY has been appointed in his place.

Mr. M. G. COWPER-SMITH, of the Tunbridge Wells Gas-Works, has been selected for the post of Engineer to the City of Newcastle (New South Wales) Gas Company, which was advertised some time ago under No. 4112.

MR. GEORGE HELPS ON THE SETTLE-PADFIELD PROCESS.

By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

The position taken by Mr. Helps in respect to this process, as expressed in his remarks published on p. 761 of the last volume of the "JOURNAL," calls for some further explanation. They are not remarkable for length, but other characteristics are not absent respecting which it may be said that "remarkable" is scarcely the word.

Perhaps one of the most striking features is want of consistency. Mr. Helps again professes anxiety to ardently support any new process that aims at increasing the yield of gas per ton of coal carbonized. But the tone he adopts is not encouraging to inventors. He commences by asserting that 12,000 cubic feet per ton can be made by the ordinary process—not only from high quality coals, but also from common or slack. And almost in the next sentence, he confesses himself at a loss to understand why I should describe a slack coal giving a fairly good laboratory test as cheap and inferior. Not only this contradiction, but after treating on several other subjects, he harks back and shows that he can understand. He says: "If slack coal be carbonized in a suitable manner, it will yield just as much gas as the screened coal. Slack coal would, for obvious reasons, be only an advantage if it could be delivered on the works at a very low figure. It would not do to pay a big carriage on it. A demand for slack would put the price up." This is exactly the same thing as saying that the coal is, in a gas-making sense, inferior and cheap.

To take another example. He challenges my statement that "the working temperature need not be so high," &c., and goes on to argue that the heat required to raise the temperature of a given weight of gas coal must be the same. And further on he says that no particulars of the coke used per ton of coal carbonized have been published—overlooking the natural inference from his argument, that the consumption of coke will be the same in either process.

He does not wish to waste time and space by discussing facts already known. Why then does he ask for make per retort, fuel consumption, and other details that obviously cannot be dealt with satisfactorily with a small experimental setting, or that have already been published? It has been stated that a set of six retorts is to be put down for the purpose of operating on a fairly large scale and affording reliable information on these points.

It is perhaps too much to suggest that, before writing or speaking so dogmatically on this subject, Mr. Helps might have taken advantage of the patentees' open invitation to inspect or test the process at Exeter. If he had done so, he would have cleared away much of the misapprehension under which he at present labours. Allowing that this is more than could reasonably be expected, as much cannot be said of his omission to read, with ordinary care and attention, the remarks that he undertakes to correct. He could have avoided asking questions that have already been answered or going over ground already covered. For instance, he says that "it would be interesting to know whether the tests were made with a dry main or a sealed main." The apparatus was fully described in the columns of the "JOURNAL" on the 23rd of June last year; and it was stated that the outlet pipe from the retort led to a hydraulic seal-box. Then he infers that care must be taken in working the process to avoid overheating the mouthpiece. There is absolutely no foundation for such a suggestion; and it is distinctly stated that there is no overheating at the mouthpiece, and that it has not been necessary to renew the working parts.

The chief objection that Mr. Helps raises is that, in mentioning the ordinary process, 12,000 cubic feet should be taken as the make per ton, and not 10,000 cubic feet. The great feature of comparisons is that they should be made as nearly as possible from equal standpoints. If electricians compare the duty afforded by electricity as furnished by the latest form of lamp, with that obtained from gas as used through a fairly ancient fishtail burner, we naturally complain that the comparison is not a fair one. Mr. Helps reverses that process, and shows an undue advantage for the old method, by taking the very highest result known for the ordinary process and comparing it with a test made (as already explained) under circumstances not over-favourable to the new. If he considers that maximum results as to yield are to be the basis for comparison, apart from other considerations, then he must in common fairness credit the Settle-Padfield process with the highest yield yet obtained from it, which is about 16,000 cubic feet per ton. Whichever way he takes it, there is an advantage in favour of the latter of quite 25 per cent.

Mr. Helps says I seem to think that, with ordinary processes, 12,000 cubic feet can only be made from a high-class coal; and he devotes a great deal of trouble to showing that high results can be obtained from slack. I have already remarked (in the June 23 article) that these have been matters of common knowledge for half-a-century. Hotspur could "call spirits from the vasty deep," but it was doubtful whether they would obey the summons; and as much appears to be the case with regard to 12,000 cubic feet per ton. For the last 25 years, to my knowledge, rumours have been in circulation that "So and So" was making 12,000 cubic feet per ton—first here, and then there. But if we consult the latest parliamentary returns and official reports, we shall find that there is no gas-works in the United Kingdom that has yet reached the make of 12,000 cubic feet, and that very few (perhaps a dozen) over the whole exceed 11,000 cubic feet; that the majority do not greatly exceed 10,000; and that by no means an inconsiderable minority are under that figure. In arriving at the average make per ton as at present obtained in ordinary everyday working, I do not consider 10,000 cubic feet very wide of the truth, and certainly see no reason for taking 12,000 cubic feet.

So much then for one side of the comparison. As regards the other, it was plainly indicated in the descriptive article that the object sought was to get a fair working on all-fours with ordinary practice in the matter of duty per retort, firing, wear and tear, &c. There was to be no forced firing, reducing weight of charge, or other conditions that increase the yield, but only at the cost of the fuel and wear and tear accounts. And it was pointed out that the 13,000 cubic feet result might be taken as under, rather than over, the mark. And no one out of the large number who have inspected the process has questioned this conclusion.

The position stands thus: I have claimed an advantage for the Settle-Padfield process of 25 per cent. as compared with ordinary working. Mr. Helps endeavours to show that I am wrong, and says (in effect) that there is nothing in the new idea; and to prove the point he quotes a result of 11,400 cubic feet of gas (quality not stated) and 9 gallons of tar as being the same thing as 13,000 cubic feet of gas and no tar. But most people will consider that 1600 cubic feet more gas is not nothing; and that it is worth a great deal more than 9 gallons of tar.

After carefully considering Mr. Helps's opinions, I see no reason for changing or altering any of the views I have expressed in the "JOURNAL" columns as to the value of the process. Time will show who is right.

MOISTURE AND CONDENSING STOVES.

By H. LEICESTER GREVILLE, F.I.C., F.C.S.

In the present brief article, I have adopted the title of Mr. F. R. E. Branston's recent communication to the "JOURNAL," as it raises certain questions which, treated from a scientific point of view, may form a fit sequel to what you have already published on the general question of "Flueless and Condensing Gas-Stoves." Mr. Branston's description of the primitive efforts of the original manufacturers of the earlier condensing gas-stoves, and their claims, is decidedly amusing; but how the gas could be kept burning in any stove which "made no provision for the escape of the vapour" is a mystery to me. The claim to produce "a small pailfull of liquid in twenty-four hours" also seems ridiculous.

There should be no confusion as to the hygienic and genera value of a flueless stove being measured by its capacity for condensation, although this has much to do with the question. I am afraid that Mr. Branston's somewhat indiscriminate use of the term "vapour" in connection with gas combustion products, scarcely conveys any really scientific meaning. Of the combustion products of gas, carbon dioxide and sulphur dioxide would be legitimately termed gases, while to the hydrogen product—viz., gaseous water—the term vapour may perhaps be legitimately used on the ground of its being readily condensible. Aqueous vapour exists as a normal constituent of the atmosphere; and in this condition is subject to all the physical laws which affect matter in the gaseous condition. All this, as a question of science, is perfectly well known; and it is only necessary to refer to the question in order to place the action of gas-stoves of a condensing type as far as possible on a clear basis. I think that this much may, however, be assumed—viz., that the stove which forms the maximum quantity of liquid combustion products is probably the most efficient, for two reasons. The first is on the question of radiant heat, and the second that of the elimination of sulphur compounds.

With reference to the question of radiant heat, the matter is simple. The proper combustion of a specified amount of gas in a measured volume of air is capable of accomplishing definite thermal effects; but, in order to obtain the most useful and economical results, these effects should be localized. This is the real difference between the use of a free burner and one enclosed in a stove. In the latter case, the heat of the gas is utilized by raising the temperature of metallic casings, which, placed in a suitable position in a room, emit radiant heat. Of the total heat produced by the combustion of the gas, a portion is rendered latent in the aqueous vapour formed from the hydrogen. Where the cooling action of the metallic casing is sufficient to effect the maximum cooling of the combustion products, previous to their escape into the surrounding air, the aqueous vapour is condensed to liquid water, and its latent heat utilized.

In regard, now, to the question of sulphur compounds, sulphur dioxide is very soluble in water; and therefore, theoretically, I should assume that the stove which had the most efficient condensation would also be the most efficient for the removal of sulphur compounds. Apart from this, maximum condensation by the stove involves maximum area of contact between metallic surfaces and combustion products; and this would no doubt conduce to the oxidation of the sulphurous acid into sulphuric acid—a fixed and non-volatile product.

As to any effect of condensing stoves on the question of the proportion of carbon dioxide in the combustion products, even the best of them must be practically valueless.

On the basis of gas of the composition I have given in a previous article, I calculate that a cubic foot of such gas would give, theoretically, barely an ounce of water (actually 0·976 oz.) I assumed a stove as burning 8 cubic feet of gas per hour, and producing 3·84 cubic feet of carbon dioxide. This is equal to a measure of 3840 oz. of water. But the gas, on combustion, would only produce 8 oz. of water, capable of dissolving its own volume of carbon dioxide. Further comment is superfluous.

To sum up. What I think has been made clear with regard to the use of flueless gas-stoves is: 1. That with properly consumed gas, and with efficient conditions of ventilation, the maximum thermal effect of the gas can be utilized with no more deleterious effect on the atmosphere than is produced by human beings, with the exception of small quantities of sulphur dioxide.* 2. That a large proportion of the sulphur in the gas is eliminated by the action of the stove.

With regard to the question of the elimination of sulphur from gas combustion products in this type of stove, it would be interesting to ascertain what is the ratio between the sulphur present in the gas and that separated by different makes of stove. This question is of the greatest importance at the present time, when the abrogation of the infliction of penalties for "excess of sulphur" is being strongly advocated by some gas companies. The time is no doubt ripe for an agitation of the question, as the almost universal adoption of the incandescent form of lighting renders it now possible to obtain a better light from the consumption of 2 cubic feet of gas, than was previously possible from 20 cubic feet. This means necessarily a correspondingly less vitiation of the air from all combustion products, including sulphur. Given a stove which, while enabling the whole of the heating power of the gas to be utilized will at the same time eliminate the sulphur compounds from the products of combustion, and the gas companies would have a still stronger case.

Tapping a Water-Main under Pressure.—A 24-inch water-main, belonging to the East London Water Company, was recently tapped at Snaresbrook, and a 12-inch branch attached to it, without any interruption of the supply, though at the time the main was fully charged with water at a pressure of about 54lbs. to the square inch. The operation was performed by means of the Smith tapping-machine, an American invention, which in this country is in the hands of Messrs. Clark W. Harrison and Co. The system is applicable to mains up to 3 feet diameter.

Acetylene Lighting on the Continent.—It is estimated that there are now 50 plants installed in Germany; while in France, the number in use at the close of November, according to the "Revue Générale de l'Açétylène," was 58, exclusive of 20 towns having acetylene plant for street-lighting purposes. In Germany, the prices range from 50s. per 1000 cubic feet upwards—56s. seldom being exceeded. In France, the price for the public lamps is about 70s. per 1000 cubic feet; private consumers paying 10s. more. Notwithstanding these high figures, the use of this illuminant appears to be extending.

Revivifying Gas-Purifying Materials Automatically.—M. Delacourt has taken out a French patent for the above-named purpose. The station meter is connected by means of a chain and cog-wheels to a smaller meter; the rate of transmission being such that the latter admits 14 litres of air into the purifiers for every cubic metre (1000 litres) of gas that passes. This amount of air is sufficient to continuously revivify the spent materials. To compensate for the loss in illuminating power caused by dilution with this quantity of air, the gas may be bubbled through a mixture of water and benzol, whereby the naphthalene is said to be retained, and choking of the pipes prevented.

* So small as to be in many cases almost inappreciable.

GAS COMPANIES' ACCOUNTS.

By William Cash, F.C.A.

[A Lecture delivered before the Chartered Accountants Students' Society of London.]

In attempting to deal with the accounts relating to the working of gas undertakings, I have purposely restricted the scope of this lecture to the accounts of companies carrying on the manufacture and sale of gas. As you are, of course, aware, many gas undertakings throughout the country have passed into the hands of local authorities. There are special features in connection with the records of these concerns. But these are not so likely to come before you in general practice as the accounts of the companies; and it is with the latter only that I propose to deal.

I see that gas accounts have been dealt with previously in a lecture delivered by Mr. Alfred Lass, F.C.A., on Dec. 4, 1888, to our Society, at a time when I had the honour of being a member of the Committee. This lecture was entitled the "Accounts of Gas Undertakings, especially in relation to Reserve, Insurance, Sinking, and Depreciation Funds, and the Legislation affecting the same." Mr. Lass dealt very fully and most ably with the subject; and there is no man in our profession more capable of dealing with gas accounts than Mr. Lass. I should like to bear testimony to the valuable work done by him in connection with gas accounts, whereby much statistical work of the greatest usefulness has been rendered available for all those connected with the gas industry.

Gas companies can be divided into two classes—the statutory, and the non-statutory companies. In the case of non-statutory companies, these being merely limited companies carrying on a gas business, no special form of accounts is obligatory. But inasmuch as most gas engineers and managers are familiar with the form of accounts with which we are about to deal, it is very usual for such companies to follow more or less closely the statutory form. I should like to urge the advantage of adhering altogether to this form, even if there is no obligation to do so.

Let me give you some of my reasons for this view: Probably sooner or later, the company in question will apply to Parliament for statutory powers; and if then an inquiry as to the past history of the applicants is involved, the record in the usual form will be ready to hand. If on such application, the company should be bought up by the local authority, as has been done in so many cases of late years, again the advantage will be apparent. The results will be comparable statistically with those of other undertakings; and, if used intelligently by those responsible for working the business, will be of great assistance to the management.

Let us now turn to our subject proper, and consider the accounts of gas companies working under special statutory authority, and therefore compelled to adopt the provisions of the Gas-Works Clauses Act, 1871.

Gas companies of a statutory nature become so by obtaining a Special Act of Parliament, or by a Provisional Order granted by the Board of Trade, and subsequently embodied in an Act confirming, as a rule, a number of like Orders granted during a session of Parliament. These Special or Private Acts incorporate the company, and, by reference, render applicable to the company the provisions of the General Acts of Parliament dealing with incorporated companies—viz., the Companies' Clauses Consolidation Act, 1845, the Gas-Works Clauses Act, 1847, and the Gas-Works Clauses Act, 1871. There are several other Acts which are often brought in; but they do not affect materially the scope of this paper, and therefore are not enumerated. In passing, it may be mentioned that the 1871 Act has been held to be retrospective, and consequently to apply to all gas companies working under the Companies' Clauses Act, 1845, and that the accounts compiled under those provisions have to be forwarded each year to the local authorities of the company's district.

Let us see what is the main spirit underlying all this special legislation dealing with gas companies. I think it is this: The company is granted a monopoly in the particular area or district assigned to it; and therefore it is put on terms drawn so that, while the business is to be conducted with reasonable safety and remuneration for the capital employed, the public—that is the consumers—are to be protected so that they may be supplied with a good article at a reasonable price; and further, the manufacture is to be conducted without creating a nuisance or offence to the neighbourhood. Thus, in one way or another, the profits to the shareholders are limited; and after the proprietors have received their due, any further advantage is made to accrue to the consumer by a reduction in the price of gas. It, therefore, naturally follows that accurate accountancy is a matter of supreme importance, particularly in the allocation of items between capital and revenue. It is important to remember, moreover, in looking at this matter from the consumers' point of view, that, although it may appear to be to his present advantage to relieve the revenue account from expenditure to the utmost allowable limit, yet a swelling and overloaded capital account will bring in the future an undesired burden of which he, or possibly his successor, will have to take his share.

I have drawn up a set of accounts of an imaginary gas company—which I will call the City Gas and Coke Company—to help us to consider the statutory forms; and I propose to run through

these with you, offering such explanations as may, I hope, elucidate them where it occurs to me points of interest or difficulty generally arise. I have drawn this as an account for a half year, following the practice of most companies; and, although these are the accounts of an entirely hypothetical company, I have been at some pains to make the various items bear a proportion to one another somewhat closely analogous to what might be found in real life. Please remember, however, that, as each statutory company works under its own Special Act, provisions vary somewhat; and I have found myself unable within the scope of this lecture to deal with all the various points which actually arise. My object to-night is to consider the accounts rather than the law on the subject.

[The accounts referred to by Mr. Cash are in the ordinary form, and as the lecture is clear without them, they are not reproduced.]

The first statement is that of capital authorized. This gives the authority for the capital, and is very useful as showing at any time the available resources of the company. You will see that our City Gas and Coke Company have been to Parliament four times. Usually, a company are granted capital powers estimated to last them for ten to fourteen years. At about this interval, Parliament ordains that the company shall present themselves again; thus affording a local authority or any aggrieved person an opportunity of appearing also, and asking for assistance if the company have not behaved themselves or have abused their privileges. It was found that the premium received on the issue of their stocks gave many companies in effect the opportunity of deferring their appearance before Parliament. It is now universal practice to grant fresh powers for such amounts of nominal capital as will, including premiums, not exceed a stated sum.

Clauses are always also inserted, in some shape or form, providing for the issue of all new capital at the full market price. This is usually done by an "auction or tender" clause, enacting that the stock shall be sold to the highest bidder by auction or tender after public notice. In this way, the capital is raised as cheaply as possible; and very largely through this provision it is a fact that, in effect, many large gas undertakings are carried on entirely, or almost entirely, for the benefit of the consumer as distinguished from the original shareholder. The latter where he is in receipt of his maximum dividend can get no more, and has no material preference over any outsider on the allotment of new capital, while all increase of business, saving of expenses, and improvement of processes of manufacture, accrue to the consumer as a reduction of the price. In the case of our hypothetical City Gas and Coke Company, I have assumed a standard price for gas of 4s. per 1000 cubic feet, with a price actually being charged of 3s., and a dividend paid on the original capital under the sliding-scale of 12 per cent.

The second statement of account is similar to the first, but relates to loan capital. The rate of interest on loan capital is always limited, and in some late Acts the auction clauses have, I believe, been applied hereto also. On the left-hand side of the capital account appears the capital expenditure arranged under suitable heads.

The revenue account follows the order of the capital, so that new works, mains, and meters can be contrasted with repairs and maintenance of the same items. Here I would point out that the statutory form of accounts does not contemplate provision for depreciation in the sense in which accountants usually employ the term—that is, by charging the expense or revenue account with a sum by way of percentage as a provision by anticipation for the wearing out of the asset by wear and tear. As an alternative, the form provides for all renewals being charged to revenue, and is very explicit in both capital and revenue accounts by the words employed in conveying the intention. Certain parts of a gas-works wear out very quickly, and require constant renewal, while others last so long as to be almost indestructible. The provision of a reserve fund for equalization of dividends also enables a company to meet any unusual demand; while there are provisions in the Companies' Clauses Act, 1845, section 122, which enable a company to spread any exceptional expense over a period.

Depreciation charges, as I have said, do not in the usual sense of the word arise; but since the form we are considering was settled, two new items or heads of account have arisen. Gas companies provide in the present day gas stoves and cookers on hire for their customers. Again, in connection with the penny-in-the-slot meter supplies, most companies undertake to fit up small houses and cottages with interior fittings, including connecting-pipes. Both these systems have developed enormous proportions, and have proved an immense boon to the community. For example, at the end of 1902, the South Metropolitan Company had more than half of their consumers supplied on the automatic system, or 104,302 ordinary and 136,822 automatic. The figures for the three Metropolitan Companies are: Ordinary, 374,656; automatic, 291,870 consumers. This has involved a very large initial outlay by the Companies, and an asset of a "short-life" character.

Stoves in the hands of a hirer (not an owner) do not receive the most scrupulous care, and fashions change. Fittings once fixed in a house, although they may legally be removed, would not pay the cost of removal, and, if they did, would not bring back the labour spent on their fixing. These facts have been recognized on all hands; and the companies have almost universally provided periodical sums as provision for depreciation. Further, many companies have adopted the, to my mind, still more accurate method of not charging such expenditure to capital account at all, but of carrying the balance of any expenditure of this nature as an asset on the balance-sheet, and writing down the balance of the account by percentage periodically. A good deal of argument has also arisen with regard to prepayment meters, the points mentioned above being used as an argument on one hand for depreciation, while on the other hand it is urged that these meters are not materially different to ordinary gas-meters, and their repair and renewal is all that revenue need bear.

You will observe that parliamentary costs have a line in both capital and revenue account. The costs of a company incurred in obtaining an Act of Parliament are a charge to capital, on the principle that the company thereby obtains a material and lasting benefit. Costs incurred in opposition to other parties' legislative proposals may, or may not, confer a benefit on the undertaking, dependent on the success or failure of the object sought; but in any event they must be borne by revenue.

In cases where expenditure is incurred, partly by way of renewal, and partly by way of extension, as, for example, when a larger main is laid to replace a smaller one, it is necessary to see that the capital account is credited with the cost of the original work displaced by the operation, or that the additional value only is charged to capital.

Let us now turn to the revenue account. The receipts are divided into four main heads: (1) Gas. (2) Rental of articles hired. (3) Residuals from coal carbonized. (4) Sundries. Gas sold on the prepayment, or penny-in-the-slot system is charged at an inclusive price somewhat above the ordinary price—the addition being the company's remuneration for the capital employed in providing the meter, fittings, &c. It is usual at the end of the financial period to reckon out the gas sold at the current price, and carry off the difference to rent of meters and fittings. Please observe that the residuals are stated at the net figure after deducting cost of labour and cartage.

Before turning to the expense side of the account, it may here be convenient to state that wages are analyzed completely, and charged to the various heads of expenditure—such as carbonizing, purification, repair of (*a*) works, (*b*) mains, (*c*) meters, (*d*) stoves, public lighting, inspection, residuals, (*a*) coke, (*b*) tar, (*c*) ammoniacal liquor. Of course, capital wages must also be dissected under their proper heads.

With regard to gas sold, the statutory form provides that the quantity sold shall be stated on the revenue account, together with the price charged. The quantity at the price will not give the money stated by reason of the discount allowed to large consumers or special prices for day consumption, &c. While on this subject, the statement as to gas made, sold, &c., is not obligatory, but is very generally adopted, and is most useful for statistical purposes.

Proceeding now to consider the expense side of the account, the expenditure is conveniently grouped under the following heads: Manufacture, distribution, public lamps, rent and rates, management, law and other expenses.

I will add a word or two on some of the items. Most of them are self-explanatory. In the statutory form, under the item of purifying are included oil, waste, and water. As a matter of practice, however, only the actual cost of purification is included under this head. The charge for gas for public lighting very generally is inclusive of services rendered in cleaning and lighting and extinguishing the lamps. The expense of doing this work is here included. Rates and taxes should not include income-tax. If there is any balance of charge after deducting all sums recovered from shareholders and others, this should be debited to profit and loss (net revenue) account. The item of general establishment charges is the "sink" to which any sums that cannot be otherwise allocated find their way. Let such items be as few as possible. As a rule, the charge under the head of auditors is lamentably inadequate. As to a depreciation fund for works on leasehold land, the form does recognize the principle of provision for a wasting asset. The annual charge under this head should be sufficient, with interest, to provide a sum adequate to replace the expenditure at the expiration of the lease.

The profit and loss account is self-explanatory; but it brings us to the reserve fund account. You will observe that, in the accounts of my imaginary company, £750 has been added during the half year. Following the usual practice, I am supposing in this case that an addition to the reserve can only be made out of divisible profits. Here the company have a standard dividend of 10 per cent., and a standard price of 4s. The sliding-scale provisions to which I have incidentally alluded provide that for every penny reduction in the price actually charged, the rate of dividend may be increased by ¼ per cent. If you refer back to the City Company's capital account, you will see that their last Act has provided some new stock with a 5 per cent. standard dividend. For that stock, of course, the additional dividend would be 2s. 6d. per cent. per annum. As the company are only proposing to divide at the rate of 12 per cent. per annum on their standard capital, and the price actually being charged for gas is 3s., they have 1 per cent. to spare; and pre-supposing they added nothing in the previous half year to reserve, they might now take to that fund £1000. The Directors you will see have added £750. Please note that an addition to the reserve can only be made after payment of the standard dividend. The fund

is available for making up any deficiency in dividends in future years, and must be invested in Government or other securities and allowed to accumulate. I am afraid this direction is more honoured in the breach than the observance by many companies.

The insurance fund is limited to one-twentieth of the paid-up capital of the undertaking, and is provided to meet any "extraordinary claim or demand which may arise from accident, strikes, or other circumstances which due care or management could not have prevented."

Please observe that the City Company have carried out their Act strictly, and have invested all their funds close up in Consols, and further that, in a previous half year, they have written down all their Consols to 85. This was a matter of prudence and strength, and not one of absolute necessity. Of course, the loss written off was charged to the various funds, and not to revenue account. I think that possibly these accounts are open to the criticism that it would not be possible for a company to invest their funds so close up. There is some ground for such an observation; but, of course, this is an ideal company, and the Directors, foreseeing a good half year, might have invested before the 31st of December.

This statement as to coal has had to be supplemented for most modern companies by additional information as to oil; and as coal and oil are grouped together under one item in the revenue account, the value of this statement, in my judgment, has been somewhat impaired. Previously, it was possible to find exactly what coal was costing a company.

From the statement as to residual products, much information most useful to the management can be compiled.

Into the balance-sheet, the balances from all the various accounts and funds we have been considering are brought together. The investments of the funds are, of course, included, and the money value of the stocks specified in the statements as to coal and residual products.

One word as to audit. The Special Acts of companies are generally silent on this important matter; and where this is the cases the Companies' Clauses Consolidation Act, 1845, applies. This provides (section 102) that the auditor shall hold at least one share, and also states (section 107): "It shall be the duty of such auditors to receive from the directors the half-yearly or periodical accounts and balance-sheet required to be presented to the shareholders, and to examine the same." The Act also empowers the auditors (section 108) to employ such accountants and other persons as they may think proper at the expense of the company.

I have been very pleased to see in at least three Bills in the present session of Parliament special sections as to audit, in which provision is made for audit by professional accountants, and membership of the Institute of Chartered Accountants is one qualification that will allow of election to the contemplated office. We should all like to see the inclusion of some such provision more general. Amateur auditors no doubt do their best; but the lack of special training in a number of instances that have come under my own personal notice, has proved most detrimental to the interest of all concerned.

I have alluded several times in the course of this lecture to statistics. Let me hint at some that are usually employed, and which are easily compiled from the statutory form of accounts—

1. Capital employed in relation to business done.
2. Working expenses in relation to business done.
3. Manufacturing results in relation to coal carbonized.
4. Residual products in relation to coal.
5. Gas wasted in relation to make, with its bearing on the repair of mains.

These are only main heads. They lead on to many smaller and equally important matters; and, as so much has been done in this direction, comparisons can be made between one undertaking and another which are really instructive and of material service. For this reason, if for no other, I think that the form of accounts which we have been considering is admirably adapted for its purpose, is particularly full and complete, and is well-thought-out and designed.

I have purposely not dealt with the books and book-keeping leading up to the accounts. That would indeed have made our subject too long. As it is, I feel that I must beg your indulgence for many imperfections in this paper, and for omissions to deal with all the points which arise on the consideration of gas companies' accounts.

The Audit of Municipal Accounts.—In answer to a question put last Monday by Mr. Chapman, representing Hyde, as to whether the Government intend to bring in a measure this session to carry out the recommendations contained in the report of the Joint Select Committee on Municipal Trading of last session in regard to the audit of accounts of local authorities, Mr. Balfour stated that the President of the Local Government Board had given very careful consideration to the recommendations, but could not accept them in their entirety. With regard to the particular subject in which the honourable member was interested—the audit of borough accounts—the President thought and hoped that, with some modifications, it might be possible ultimately to adopt the recommendation. But as this was a controversial matter, Mr. Balfour did not think it would be possible to deal with it this session.

MARINE PROPULSION BY GAS-ENGINES.

At the recent Meeting of the Institution of Naval Architects, a paper dealing with the employment of gas and oil engines on shipboard was read by Mr. J. E. THORNYCROFT.

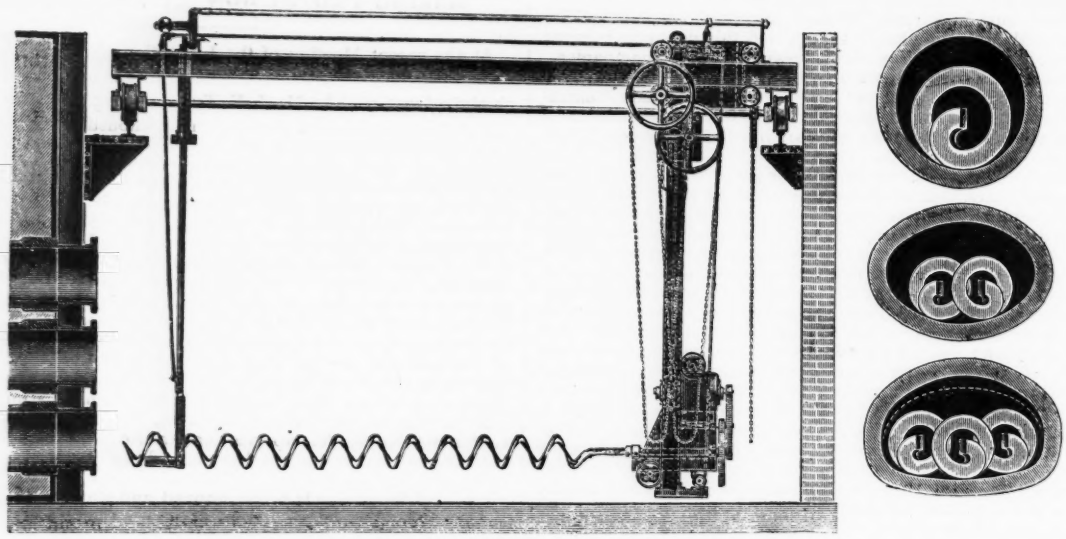
The author remarked that internal combustion engines might be divided into three classes, according to the fuel used: (1) Engines in which the combustible employed will vaporize at atmospheric temperature; (2) those in which it requires vaporizing by heat or by spraying; and (3) gas-engines, driven by gas obtained from some form of producer using solid fuel. With regard to the third class of engines—those in which our readers are interested—Mr. Thornycroft said they had hardly yet been tried for marine purposes; but, owing to the recent great improvements in gas-producers, it was thought they would soon be used extensively. He went on to point out that an engine designed for working with gas from solid fuel consists essentially of the same parts as engines of the first and second classes, but without the apparatus for vaporizing the oil or spirit; the gas-producer taking the place of the vaporizer, but being necessarily much more cumbersome. The gaseous fuel produced is, however, essentially different from that generated by the vaporizer or carburettor of engines of the first two classes, as it is a stable gas, and can be stored as desired, while the vapour cannot; so that when manœuvring is taking place, and the engine is being stopped and started, the producer is not entirely put out of action, as is the vaporizer, but, to some extent, can act as a fly-wheel and reserve of power, like a steam-boiler. The recent improvements which have enabled the producer to be worked without the reservoir for the gas—the engine sucking the supply direct from the producer—make the apparatus less bulky, and so better adapted for marine purposes.

In the course of further remarks, Mr. Thornycroft said it was well known that gas-engines of even small powers, supplied with producer gas, give considerably more power per pound of fuel than could be obtained with a steam-engine and boiler; and when large plants are used, a stated quantity of fuel will produce about four times the power obtainable with ordinary steam-engines. Gas-producers must be divided into two classes—those working with non-bituminous coal, and those using bituminous coal. One of the former class, working as a suction producer, is very simple, and weighs, as made for land purposes, considerably less than the ordinary type of steam-boiler to do the same work; but, owing to its being restricted to one kind of fuel, its use must be very limited for marine purposes. The author added that the producer invented by Dr. Mond for using bituminous fuel had not yet been worked out suitably for marine purposes, and as used on land was heavier than boilers of the same power; but it seemed probable, he said, that, owing to the much greater economy obtained, and the rapid development now going on, it would soon be possible to employ producers of this type.

THE EITLE STOKING MACHINERY.

An account was given in the "JOURNAL" for Oct. 6 last year (p. 45) of two forms of machines for the charging of horizontal retorts as made by the firm of C. Eitle, of Stuttgart. The account was derived from a communication by Herr W. Mast, the Chief Engineer of the firm, to a meeting of Dutch gas engineers. The same gentleman afterwards read a paper before the meeting of the Mid-Rhenish Association of Gas and Water Engineers, at Darmstadt, in which fuller particulars were given of the Eitle pattern of projecting charging machine; while a drawing machine of novel design was also described. We to-day take the opportunity of giving in the sequel the supplementary information which has thus now become available through the pages of the "Journal für Gasbeleuchtung."

The attention of gas engineers has of late years been specially directed to the advances which have been made within the retort-house, particularly in connection with the epoch-making invention of the inclined-retort setting. Mechanical charging arrangements were required for inclined retorts; and the whole disposition of the retort-house became altered thereby. It was found that expenditure of capital on such installations was well repaid by the economy in wages achieved. At the present time, when enlargements of old, or the building of new, works is under consideration, there is a choice between the inclined-retort system and horizontal retorts with mechanical charging and drawing apparatus. Herr Blum, of Berlin, in a recent paper on such apparatus, referring to the Paris turbine charging machines, said that the firm of C. Eitle had earlier made experiments on the projecting of coal by means of turbines. Their machine was then patented in Germany, and was being perfected by the removal of faults and by simplification; so that at the present time it is held to be thoroughly tested and to have had the exhaustive claims made for it fully substantiated. This machine is the one that was described in the "JOURNAL" of Oct. 6 last, under the title of the "Kobold;" and by reference to the illustrations (figs. 2 and 3) then given of it, it will be understood that within the propelling drum are two rapidly rotating fans, which hurl the coal out of the projecting mouth, which is directed into the retort. The coal is brought in



a uniform feed on to the fans from a small measuring vessel which just holds one charge. Above this vessel is a larger receptacle from which the charges are withdrawn as required through a mouth which is closed by a slide, and a shoot. The latter consists of sliding portions acting like a telescope; so that the mouth of the apparatus may be brought to the levels of the several tiers of retorts. In small works, however, the measuring vessel may be filled by hand labour direct from the stage.

The charging of a retort by this machine proceeds from the back, in a layer of the required depth, up to the mouthpiece, by the process of laying one piece of coal against another, The rotating fans maintain a uniform speed; and the reduced throw corresponding with the progress of the charging is secured by gradually lowering the mouth of the machine. This is done by the attendant, and automatically effects the simultaneous lowering of a flap by means of which the *vis viva* of the lumps of coal is correspondingly reduced. There is also a disc-like screen on the mouth of the machine, which is pushed against the mouth of the retort being charged, in order to prevent an inrush of cold air and an outrush of flame. A weighing apparatus is attached, which shows the weight of the charge on an index, and automatically registers the charges; so that thus not only can the weight of the charge be determined, but also the quantity of coal charged in a given time—say, twenty-four hours. The whole apparatus, including the storage receptacle, is arranged on a crane travelling on rails, which are supported on brackets, firmly attached on the one side to the buckstays of the bench and on the other to the opposite wall. The whole can thus be installed without interrupting the work of the retort-house. The fans can be driven by an electromotor or by an endless rope traversing the retort-house, and the mouth of the machine can be inserted in the mouthpieces of the retorts, and the machine moved along quite easily by hand.

A drawing machine for horizontal retorts for use in conjunction with the "Kobold" charging machine may next be referred to. The labour of drawing retorts by hand is even more severe than that of charging. The unequable distillation of the coal and the partial caking of the coke on the walls of the retort, have to be contended with; while the stokers are exposed to the heat and the gases from the red-hot coke. All these difficulties have to be met in a drawing-machine, and, further, the coke must not be broken small but kept in as large lumps as possible. Practical trials of the drawing-machine shown in the above illustration have demonstrated that it fulfils all these requirements.

The drawing is effected by two spirals, or conveying screws *minus* the core, which are supported at one end so as to be carried free and capable of being turned, as appears in the illustration. One is turned to the left and the other to the right; so that their threads gear into one another. Both screws are geared together by a pair of cog-wheels, so that they are rotated in opposite directions. They are driven by an electromotor, or an endless wire rope may be used instead. The machine works in the following manner: The screws are set in rotation by the motor, while at the same time they are introduced by hand by the attendant into the retort. Their points then work their way into the cake of coke, and break it free piecemeal, or cut it up. A space is formed at every turn by the contrary rotation of the screws, corresponding with a piece of coke which has been set free; and in this space the piece of coke works backwards to the mouth of the retort, while the screws move forward to the back of the retort, on reaching which their points will have loosened the cake of coke throughout its length. The movement of the spirals backwards, while they are still rotating, brings them more or less apart, and so scours the walls of the retort. When the spirals have been withdrawn from the retort, their points are carried and guided by a bearer. The whole apparatus is carried, like the charging-machine, on a crane travelling on the same rails as the latter. The crane-like carrier supports, on the bench side, a water reservoir, with an outlet pipe and sprinkler attached, so that a stream of water is brought to play on the spirals. The sprinkler comes automatically into operation when the screws are withdrawn, so that they are cooled; and the discharged coke is at the same time partially quenched.

THE CARE OF RETORT-BENCHES.

The subject of the care of retort-benches and the advantages resulting therefrom was dealt with in a paper read at the recent annual meeting of the Michigan Gas Association by Mr. T. J. Whalen, of Jackson.

The author began by impressing upon his audience the fact that the foundation of the success of a retort-bench is the care it gets; and he then proceeded to show what this care has done and can do. In the first place, he said, the bench must be properly constructed with good material well put together. The material must not be exposed to rain or snow; the bricks must not be chipped, cracked, or broken; and the ascension-pipes must not be so long as not to allow of expansion. If care is not exercised in these matters, the stokers will be daubing on clay day after day to stop leaks. "Poor benches" is no excuse for a manager to submit while good ones can be obtained at no greater expense. Want of care is the cause of the mains pitching, the tar being thick, dirty, and poor, the stand pipes plugged up, the retorts full of carbon and the fire-boxes of clinker, the flues stopped up, the heats going down and the expenses increasing, and six benches doing what five ought to do. When some people see stokers charging and drawing retorts, they imagine that this is all there is to be done; but to have a bench giving satisfactory results month after month and year after year needs a great deal more care than the stokers give. If a manager leaves the care of the benches entirely to the stokers, he soons finds out his mistake. The author then passed on to describe the nature of the attention he gives to his benches; taking the retort-house at Jackson as an example. He has two stacks of retorts—five settings in one and three in the other. They are of three-quarter depth recuperative furnace design, fitted with double smoke-stack dampers. He is running five of the settings, which have been under fire for periods ranging from 14 to 34 months; and when he takes the carbon out of the retorts, it is very seldom that more than a quarter-of-an-hour is required for patching—in fact, in some cases scarcely any is needed.

Beginning with the fire-box—one of the most important features of a retort-setting during its operation—the author described his treatment of it as follows: When using coal or coke as fuel, the furnaces are filled to within 10 inches of the arch tile of the box, and great care is taken to have the back end as full as the front. When firing the furnace, it is filled from back to front with the shovel—that is, the fuel is thrown to all parts, not dropped in and then pushed back. When the fuel is dropped in through the door, whatever fine stuff there is packs up in front, and one part of the fire is loose while the other is solid. Furnace-doors that are so small, and so arranged that fuel cannot be thrown back in this way, are not economical. They are very injurious to the furnace, because the back end will be continually hotter than the front, and the same with the retorts. Charge the furnace as carefully as a retort. When a furnace receives a little heap of fuel in the front or the middle of the fire-box, the company suffer as much loss as when a little heap of coal is thrown into the front or the middle of a retort. What is wanted is a man as careful in charging the furnace as he is in charging the retorts.

The following is the author's system of working the five settings: He makes a "round" every hour, consisting of drawing, charging, and firing or breaking up. When this is finished, he has done with the fire-boxes. Each retort is charged every four hours, and each furnace every two hours. In the hour between the charging of the furnaces they are broken up from the charging-floor when using coal, and from the ground floor when using coke. The bottom of the furnace is cleaned out every six hours; great care being exercised not to remove any fuel from the fire-box. The ashpan is cleaned, and all cinders that might get into the primary air ports are taken out, the ashpans filled with water, and the steam under the fuel regulated. The steam-pipe is so arranged that the steam goes into the fuel directly at the centre crossbar holding up the grates. It is a $\frac{3}{8}$-inch pipe, fitted on the end with a cap having a hole $\frac{1}{8}$ inch in diameter drilled in it. The pipe extends in and up at an angle of about 45° to some 8 inches past the crossbar. The steam helps a great deal in preventing the formation of clinkers; the fuel burning more to ash. Just before the fuel in the fire-box comes to a white heat, steam is admitted. When it does not appear white, no steam is used. When this system is properly worked, with the assistance of the breaking-up bar, very few clinkers appear. The breaking up is done with a $1\frac{1}{4}$-inch bar 8 feet long, with a hand ring at the end and a chisel edge. This bar is pushed down to the front end as closely as possible, and pulled backwards, throwing back the fuel, and breaking up the front of the fire; consequently the fire becomes loose all through, and uniform heats are obtained.

When using coke as fuel Mr. Whalen treats the fire-box a little differently. Instead of breaking the fires up from the top every two or three hours, they are broken from the bottom every two hours and from the top every six hours—in other words, every time he cleans out. When using coal in the furnaces, supplementary bars are used once a week. With coke, it is found necessary to use these bars at least twice a week. These supplementary bars are put in on top of the water-table, or about 24 inches above the grate-bars. All clinkers, from the back, front, and sides, are cleared away; care being taken not to remove the fuel. When this is done, an ordinary retort rake is put through the firing-door, and all the fuel on the bridge wall drawn back into the fire-box. This leaves the furnace level full, as if it had only been hooked; then a small amount of fresh fuel will put the fire-box in its original condition, and no loss of heat through clinkering has been suffered. He says he does not have the old familiar excuse, when the question is asked, "What is the matter with that bench?" "Oh, it was clinkered this morning; it has gone down," for care for the fire-box has kept it up. He has had stokers in Jackson since October, 1901, and they have never seen what a fire-box looks like on the inside, for he has never had one empty. Care for the fire-box prevents the trouble often experienced with clinkers.

Another important matter to which Mr. Whalen directed attention was the openings in the front of the benches. He pointed out that a very few openings will increase the fuel from 5 to 10 per cent. He keeps all openings and cracks in the fronts of his benches well plastered up, as it helps a great deal towards heating the front ends of the retorts, and decreases the fuel per ton of coal carbonized. Another feature is keeping the secondary air nozzles open, where they enter the furnace. His advice is: Keep the primary chambers and ports clean, and especially keep the recuperators clear; otherwise the secondary air will be admitted cold. To determine how to operate a bench economically, in changing from coal to coke, requires constant watching. The author experienced considerable trouble with the heats. First he used half coal mixed with coke. Next, one-quarter coal, and then one-eighth coal, until he had the men firing with "straight" coke. Then he decided that uniform heat could be kept and as much coal carbonized with coke as with coal. In the following month he changed another retort-house from coke to coal in the same manner, and experienced no trouble either with the heats or the men. He also determined that greater care of the furnace must be taken when using coke, or the lining would be injured, provided they were running a bench to its full capacity.

The author next took up the subject of the charging o. retorts. He pointed out that considerable time has been expended in obtaining uniform heats; and a great deal must be done to ensure uniform charges, as they will help the heats, increase the capacity of the setting, tend to prevent stopped ascension-pipes, and improve the fuel results. When a retort is properly charged, the coal is level, the same height back to front, tapering down at the mouthpiece. Mr. Whalen has two men charging together. He trains them to charge crosswise, so as to get the coal up against the sides of the retort—in other words, to keep the coal in the retorts as low as possible. This system prevents superheated gas, which gives rise to thick tar, lampblack, stopped pipes, and naphthalene troubles. All his charges are inspected by the foreman, and a record is left on the Superintendent's desk, reporting how he received everything from his opposite foreman; and such conditions are carefully noted. The charging is left to the foreman's judgment. If one retort or setting appears a little hotter than the others, which is very seldom the case, he orders some more coal to be put into it; but he always carbonizes in the two settings exactly the quantity of coal decided upon by the Superintendent.

Under Mr. Whalen's system of stoking, the duties of the men are so arranged that all have equal shares of the work; and as each man becomes experienced in his particular part, they have no trouble in obtaining good results. There are five stokers in each gang, running five settings. No. 1 stoker, or "house foreman," as he is called, is responsible for all the work. His duties consist in taking care of the exhauster, and looking after the hydraulic main, to see it is in good order; that the seal is not too high or too low—thereby obtaining uniform pressure in the ascension-pipes. In front of the settings there is a double-acting water-gauge, by which the foreman is able to adjust the seal in the main. The day foreman runs off the tar-tank and takes care of the tools, seeing that they are in good shape for the night foreman. He is also responsible for the neatness in the appearance of the house. The duties of the other four stokers are as follows: No. 2 helps No. 1 to do all charging and firing, looks after the stopped pipes, and assists in breaking up and clinkering fires. No. 3 helps in the drawing of the retorts, keeps the house clean, looks after all leaks on the benches and assists in firing, breaking, and clinkering. No. 4 draws one or two retorts each round, and loads all coal. No. 5 draws one retort on each round, takes care of all the coke and ashes, and is responsible for the appearance of the cellar. This division of duties is adhered to as strictly as possible, although any man is perfectly welcome to assist any other as long as his own work is properly done.

The men at Jackson work in two shifts of twelve hours each, starting at 6 a.m. Each round begins with the hour. They open six retorts at one hour and nine the next; alternating thus through the day. They open one side of every other setting; drawing the top, middle, and bottom retorts at the same time. Great care is taken, when the lids are being opened, to prevent what is called "shooting" them off, which is a fruitful cause of leaky mouthpieces. When the lids are opened, No. 2 stoker chips out the mouth of each ascension-pipe, which prevents the accumulation of soot and tar, and makes it much easier to get the reamer through the pipe. Only six retorts are opened at one time. When there are nine to be charged, the last three are not opened until the first three are closed. While No. 2 stoker is chipping out the pipes, Nos. 1 and 5 ream out the first three, and Nos. 3 and 4 the other three. They use an auger reamer 5 inches in diameter with a long handle; and it is pushed to the top of each pipe. Stokers Nos. 1, 2, and 5 draw the first three retorts, all working together. When these are drawn, Nos. 1 and 2 begin charging, while No. 5 quenches and takes out the coke. Nos. 3 and 4 draw the second three retorts; and when there are nine to draw, they open the third three as soon as stokers Nos. 1 and 2 have the first three charged. Nos. 3 and 4 also take care of the coke that scatters on the floor, pushing it down the shoots and closing them, so that no charging coal will find its way to the coke-bin. The first three are usually charged in about six minutes. The first six retorts are charged and closed in from 8 to 11 minutes; and when there are nine to charge, the other men usually have the last three drawn and ready as soon as the second three are charged; thus the entire nine retorts are charged and closed in from 14 to 17 minutes. All the coal or coke used is weighed upon retort-house scales, which are tested every month; and the foreman of each gang makes out a complete bench report at the end of the shift.

The next matter taken up by Mr. Whalen was the clearing of the ascension-pipes. Each foreman has charge of the three pipes on one side of each setting. Every Monday the foreman burns out all his pipes. The caps of six retorts are opened at a time, a few minutes before the time of the round on which they come is up, and all hands go after them. They first use the 5-inch reamer, and follow it up with a 6-inch one, and keep at them until the large reamer rattles up and down. Then they are scraped down from the top with a long half-moon scraper, the caps are immediately closed, and they are ready for drawing and charging. It seldom requires more than six minutes to clean out six standpipes; but it often happens that Monday finds the pipes in very good condition. Nevertheless, the men go at them and burn them all out; for it is only by keeping the system regular that good results are obtained. The foremen are responsible for the carbon in the whole of the retorts of the ascension-pipes of which they have the care.

The bench workings at Jackson are not estimated, but arrived at by an accurate accounting of daily results. It has been in the past, and still is, somewhat common for gas managers to estimate their fuel; but Mr. Whalen says estimates should not be used if there is any possible way of avoiding them. He has little faith in the figures of works where the fuel is not weighed daily. He works out the average charge per retort every four hours, without deducting anything for retorts decarbonized. This average is obtained by reckoning six retorts per bench, 365 days a year; and all his results are figured on the same basis. Different methods of calculating are in part responsible for some of the wide differences reported in various cities; but accuracy in accounting for fuel is desirable and necessary, if intelligent work is to be done.

With regard to the managership of the New Wortley Gas-Works of the Leeds Corporation, rendered vacant by the removal of Mr. J. Bond to Southport, 30 applications have been received. The matter has been referred to a Sub-Committee, who will reduce the number to six.

REGISTER OF PATENTS.

Combined Coal and Water Gas Plant.—Jones, W. R., of Manor Park, E. No. 5781; March 12, 1903.

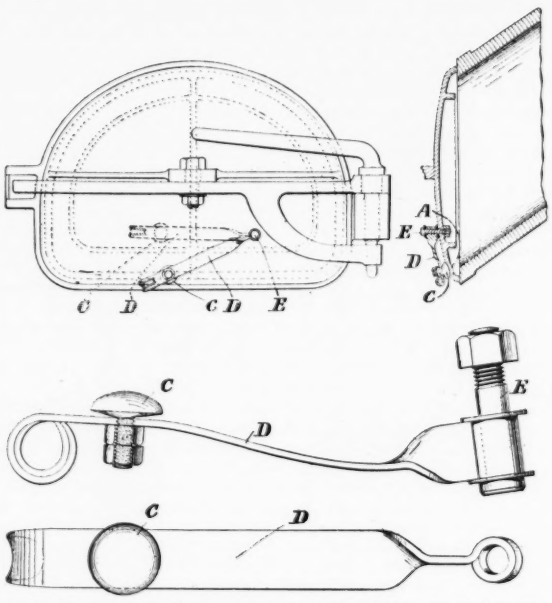
This invention refers to apparatus for dealing with coal gas during the ordinary course of manufacture, by causing it to combine with a large proportion of freshly-produced water gas while both are at a high temperature—thus taking up and rendering fixed the hydrocarbons which ordinarily form with the tar which collects in the mains before the gas has been condensed and purified. A full illustrated account of the arrangement proposed appeared in the "JOURNAL" for Dec. 29, pp. 822-4.

Mouthpieces for Inclined Retorts.—Gibbons, G. B. A., of Dudley, and M'Ewen, C. J., of Liverpool. No. 7251; March 28, 1903.

This invention is designed to enable the pitch or tar to be withdrawn from the mouthpiece as it settles, by providing in the lower part of the mouthpiece lid, or in the bottom of the mouthpiece, one or more holes closeable by a valve or stopper.

The illustrations show a front elevation of the lid and mouthpiece, and a cross sectional elevation of same; also an enlarged plan and front elevation of the valve and connections.

A is the hole provided in the lower part of the mouthpiece lid, and C is the valve or stopper by which the hole is closed. The valve or stopper is by preference of mushroom shape, and carried by a flat section spring arm D, which has a half twist, and is turned into an eye at one end, where it fits on to the fulcrum pin E fixed in a hole in the lid. The outer end of the arm is turned into an eye for convenience in moving it and its valve to open the hole, as indicated by the dotted lines.



Retort-Charging Apparatus.—Foulis, W. (Executors of the late), of Glasgow. No. 8477; April 14, 1903.

This invention relates to apparatus for charging retorts wherein a scoop receives the coal and is propelled with considerable speed and then suddenly stopped; a pusher being also provided to assist in the charging operation. Apparatus of the kind was described in patent No. 7845 of 1901.

According to this invention, the same hydraulic ram is employed to operate both the scoop and the pusher. The cylinder of the ram is connected with the pusher, and is thus moved along a stationary piston and rod. The cylinder is engaged by triggers or catches with the carriage of the scoop, so that when the cylinder is moved forwards towards the retort the pusher is moved forward, and the carriage and scoop are also carried forward until the carriage of the scoop comes in contact with a stop, about which time the triggers or catches are released from their engagement with the cylinder, the pusher proceeds without the scoop, and pushes from the scoop the charge, or the part of the charge which has not entered the retort by momentum on the stoppage of the scoop. When the charging is to be effected at more than one operation, similar stopping and disengaging devices are arranged to the rear of the stop and disengaging device; the stopping and disengaging devices being arranged and provided with means for operating them, so that they can be moved out of the way on the strokes at which they are not to act, and into position on the strokes at which they are to act. The return movements of the scoop and pusher are effected by fluid, under pressure, admitted to the cylinder at the other side of the piston, or by an independent ram. Fig. 1 and 1a represent in side elevation, partly in section, a retort-charging apparatus constructed according to this invention; the scoop and carriage to which the scoop is attached being shown in their normal (or withdrawn) position. Figs. 2 and 2a are plans. Figs. 3 and 3a are views (partly in section) similar to figs. 1 and 1a, but showing the scoop, its carriage, and pusher in their extreme forward positions.

The frame of the charging apparatus is made of channel bars, on which the carriage carrying the scoop A travels to and from the retort to be charged. Passing through a socket or collar B on the carriage is the cylinder C of a hydraulic ram, the piston-rod of which is connected, at its rear end, to the outer end of the frame. The piston-rod carries, at its forward end, a piston packed to fit the interior of the cylinder C; and it has an axial passage communicating, at its forward end, with the forward and closed end of the cylinder. The rear end in it communicates with a box containing the valves by which the fluid is admitted to, and exhausted from, the cylinder. To the forward end of the cylinder is fixed the pusher D provided with a wedge-shaped

Fig. 1.

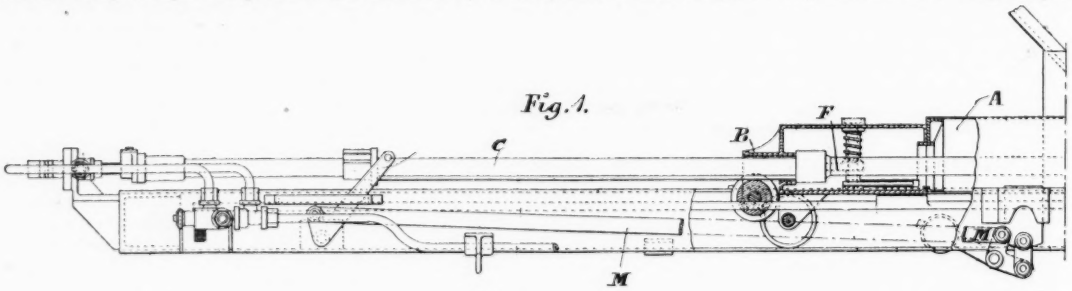


Fig. 2.

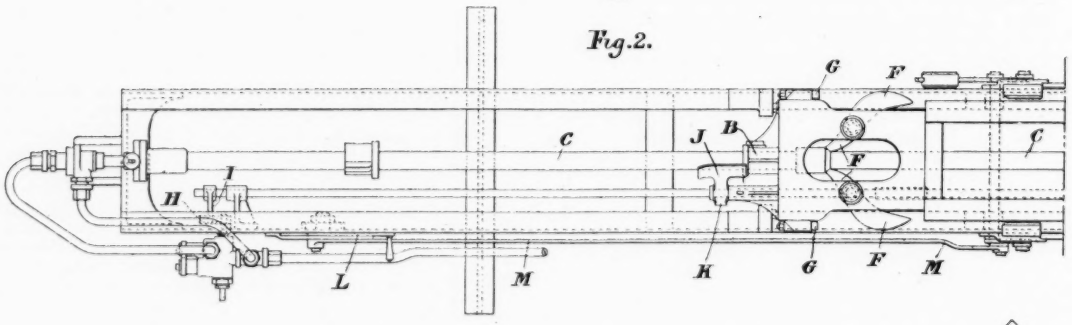
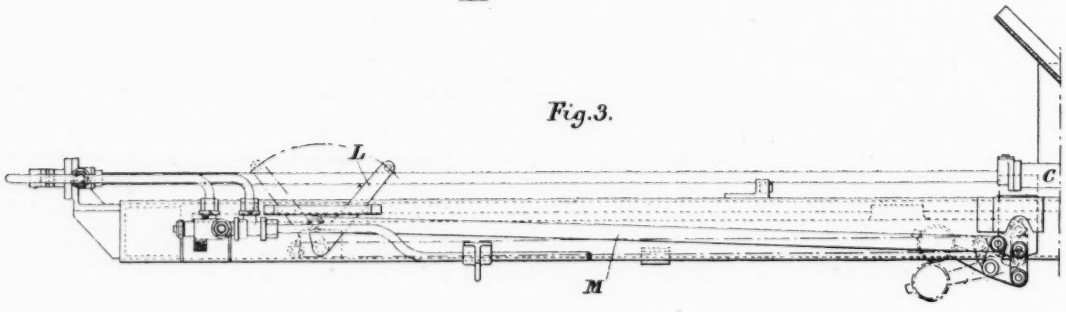


Fig. 3.



projection E, which, when the pusher is in its extreme forward position, projects beyond the scoop into the retort. On the cylinder is a collar with which triggers or spring detents F, capable of turning on pins on the carriage, are caused to engage; so that, by the forward movement of the cylinder, the carriage, together with the scoop, will be travelled forward, so that the scoop discharges its coal into the retort. On the frame are projections or cams, with which the tail ends of the triggers or detents come into contact, so as to remove them out of engagement with the collar on the cylinder. The projections or buffers G on the carriage come into contact with the projection or stops, so that the forward motion of the carriage is suddenly arrested, and the contents of the scoop, or a considerable part, are projected into the retort; and thereafter, by the continued movement of the cylinder C, the pusher D is moved forward along the scoop, and the projection E proceeds further into the retort beyond the scoop, as shown in fig. 3a.

The forward movement of the carriage is effected by turning a spindle in the valve-box so as to operate the valves to admit water under pressure through the axial passage in the piston-rod—thereby driving the cylinder C, together with the carriage, forward until the projections or buffers G on the carriage come against the projections or stops; the triggers or detents F being then disengaged from the collar on the cylinder, as already described.

On the spindle by which the valves in the valve-box are operated is an arm H, engaging with an arm I on a rod or spindle carried in brackets on the frame, on which rod or spindle are fixed, or formed, two projections. Mounted on a stud carried on the rear end of the carriage is a two-armed lever, one arm of which, J, is provided with a curved projection weighted so as to normally maintain the other arm out of range of one of the projections on the rod or spindle. On the cylinder K is a collar which, when the cylinder is completing its forward stroke, comes into contact with a curved projection on the lever so as to turn it on its stud and cause the arm of the lever to come into position to act so as to turn the valve-operating spindle and cause the exhaust-valve to open and the inlet-valve to close.

The foregoing charging operation causes the rear part of the retort to be charged. The second operation is to charge the forward portion of the retort; and therefore the stroke must be of less strength. For effecting this, an additional removable stop is provided on each side-frame, which can be brought into position for action by the lever L. Each of the additional stops is fitted to slide in a guide, and is connected by a link to one arm of a bell-crank lever fixed on a rock-shaft, to the other arm of which lever is connected one end of a rod M, the other end of which is connected to the hand lever L, centred to the frame, so that by turning the lever in one direction or the other the stops can be moved into, and out of, operative position as required.

When the stops are moved into operative position, the projections or buffers G on the carriage will, as the cylinder is moving forward, come into contact with the stops, and thereby check the forward movement of the carriage; and at the same time the stops will remove the triggers or detents out of engagement with the collar on the cylinder, and permit of the cylinder, with the pusher, continuing its forward movement, so as to push the charge from the scoop into the retort and cause the projection to enter the retort—the collar on the cylinder, by coming into contact with the curved projection E on the lever, causing the exhaust valve to open, as already described.

Fig. 1a

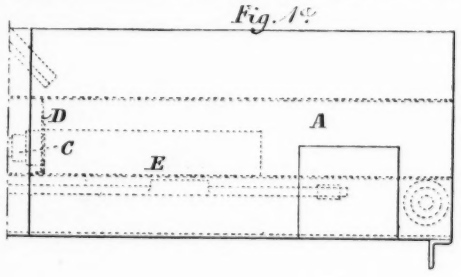
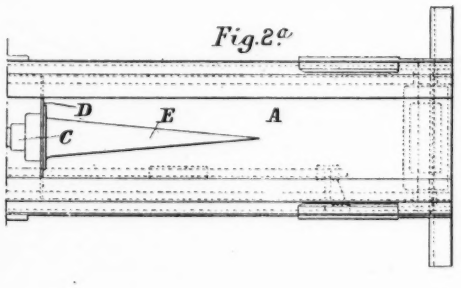


Fig. 2a



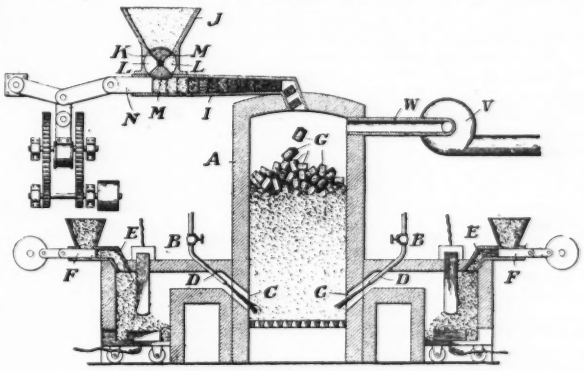
Manufacture of Water Gas.—Boult, A. J.; a communication from W. A. Köneman, of Chicago. No. 28,761; Dec. 31, 1903.

The manufacture of water gas according to this invention is rendered continuous by employing the heat of the electric arc to compensate for maintaining the incandescent condition of the fuel against the heat-absorbing effect of the steam employed in undergoing decomposition.

To accomplish this object, advantage is taken by the patentee of the fact that, in the various uses of the electro-metallurgical furnace, a large proportion of the heat from the electric arc is wasted. Thus, for example, in the use of the electric furnace for the manufacture of calcium carbide, by far the larger portion of the heat from the arc is, it is said, lost; and the object of the invention is to utilize the surplus heat made thus available, which amounts to fully 75 per cent. of the total heat—the portion taken up by the work in the furnace and through loss by radiation being less than 25 per cent. of the total.

The illustration shows, in vertical sectional elevation, a gas-producer with a plurality of electric furnaces connected with it at different points near its base for discharging therein their surplus heat, steam-jets discharging into the producer near its base, and a briquette-machine for feeding the fuel into the producer at its upper end.

A is a gas-producer. B are electric furnaces of any suitable type. The calculations of the patentee are based on the employment of the electric furnace as used for the production of calcium carbide; and in order to show the full benefits to be derived therefrom, it is assumed that the gas is manufactured from anthracite and bituminous briquetted fuel, and that 10 tons of this fuel are to be converted into gas in twenty-four hours, which would be the capacity of two generators, each requiring to be connected with four carbide furnaces each receiving a current of 250 E.H.P. generated by water power. Owing

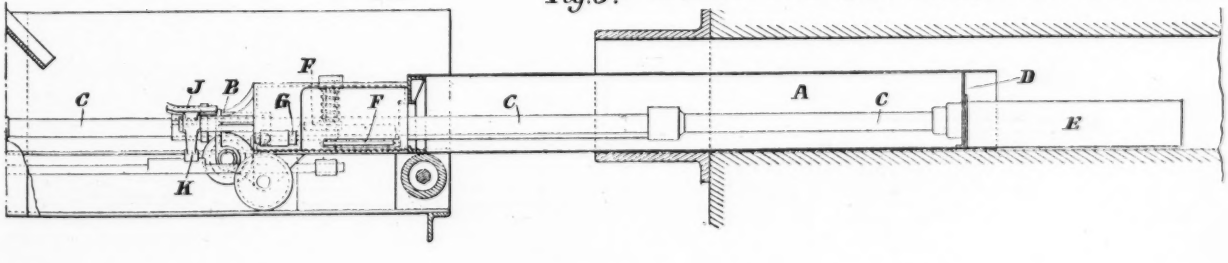


to the nature of the view selected for the illustration, only two of the furnaces B are shown, connected with the producer through conduits C leading into it at opposite sides near its base, with steam-jets D directed into the producer. Moreover, the supply of materials to each furnace to be subjected therein to the action of the arc for converting it into calcium carbide, is shown to be through a feed-passage E discharging into the top of the furnace under pressure from a reciprocating piston F, driven by power (not shown) for closing the passage to the excess of air, for a purpose hereafter described.

The fuel G—in the preferred form of briquetted finely pulverized anthracite and bituminous coal, agglutinated together, and in suitable proportions—is fed to the producer by suitable apparatus, such as that shown at H, and involving the following described construction: A tube I of proper dimensions to form a briquette of the desired thickness, and open at both sides, is supported to discharge at one end into the producer through its top. On the tube, near its outer end, is a hopper J, provided in its open base with a rotating cylinder K containing opposite pockets L between segments M; the capacity of each pocket being for sufficient material to form a briquette. The pulverized mixture of coals supplied to the hopper fills each pocket as it comes, by the rotation of the cylinder, into position to receive the supply, and is dumped, by the continued rotation of the cylinder, into the tube I in advance of a piston N while the latter is on its back-stroke. The piston is shown connected with a toggle-device having a link-connection with a cam on a rotary shaft carrying gear-wheels meshing with pinions on a suitable drive-shaft. The action of the cam against the toggle-device reciprocates the piston N to compress the material, fed in suitable quantity from a pocket K in advance of it into the tube H, into a briquette G; the mechanism being so timed that a pocket dumps its contents during the back-stroke of the piston, and is in position to be filled from the hopper during the forward piston-stroke. Thus, by the briquette-forming action of the piston the briquettes are also fed into the producer, and in their desirable green condition, by the crowding of the briquettes through the tube I. The piston, moreover, closes the tube against the ingress of air in the same way that the piston F closes the passage C.

At V is shown a suction-fan in a conduit W leading from the upper end of the gas-producer, for taking off to a holder (not shown), or to the point of its consumption, the gas generated from the fuel in the

Fig. 3a



producer under the action of the steam admitted to it, and the surplus heat from the furnaces supplied continuously to it both for generating gas from the fuel and for supplying to the producer an amount of heat greater than that abstracted by dissociation of the water vapour.

The patent specification closes with a detailed calculation to demonstrate the economic advantage afforded by this improvement.

Retort-Charging Machines.—West, J., of Southport. No. 7965; April 6, 1903.

In patent No. 1097 of 1900, the present inventor described a charger as having three supporting wheels which run upon the floor of the retort, and made of such a length that it is necessary to send it into the retort twice in order to charge a retort of ordinary length. In the present invention, he constructs this type of charger of such a length that it will charge a retort about 10 feet or more long in one operation; and, instead of supporting the charger on wheels made to run on the floor of the retort, it is fitted to a carriage having four wheels supported by, and running along, a frame forming part of the charging-machine. Thus no portion of the charger rests against or on the retort. He also combines with this type of charger mechanically-driven mechanism for reversing the charger scoops for the purpose of emptying them of coal when in the retort and righting them again into the position for receiving their supply of coal from a coal-hopper fixed above them.

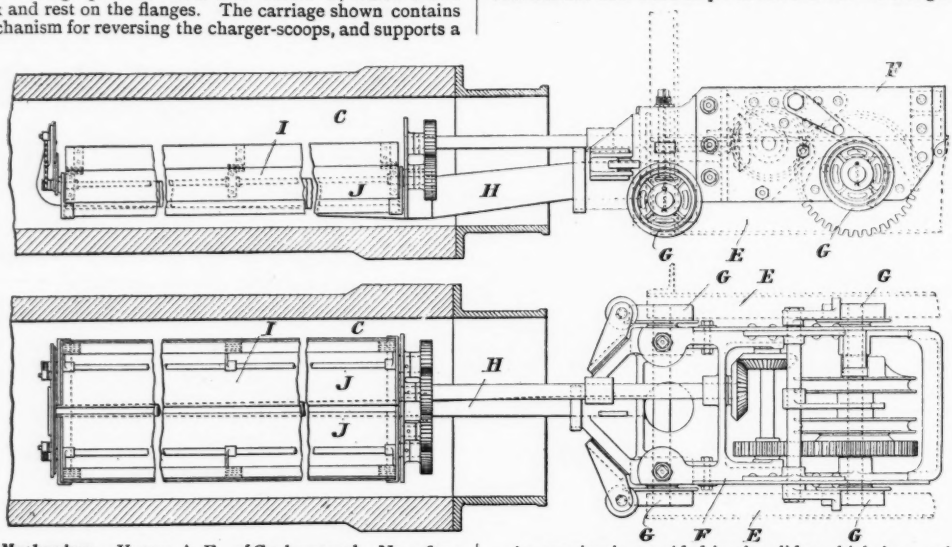
The illustration shows a side elevation and plan of the charger in its position when it is in the retort and the carriage which supports the charger scoops has travelled to the end of the frame or track suspended from the coal-hopper.

The frame E, together with the coal-hopper, is provided with gear for hoisting and adjusting it to the tier of retorts to be charged, and is for the purpose of supporting the charger and providing a track for the charger-carriage, which is made to travel to and fro when charging a retort. F is a carriage provided with four wheels G, which travel along the track and rest on the flanges. The carriage shown contains part of the mechanism for reversing the charger-scoops, and supports a bar H, which extends the whole length of the charger I, which is constructed with two scoops J, provided with hinged sides.

The charger I, with its scoops, is similar to that described in patent No. 1097 of 1900; each scoop consisting of two parts adapted (when reversed for discharging the coal) to slide one within the other, so as to offer no obstruction when the charger is being drawn out of the retort over the coal. In the patent referred to, the charger was supported on three wheels which run on the floor of the retort. In the present invention, the wheels are dispensed with, and the charger centre bar H, which is fixed at one end of the carriage, is extended—the carriage being provided with four wheels, which support the part of the charger entering the retort.

The carriage F is provided with a doubled-grooved chain-drum, to which the chains for pulling the charger in and out of the retort are attached. These chains lead from the chain-drum round pulleys fitted to the frame or charger track E, and are then attached to a chain-drum. This is revolved forwards and backwards when driving the chains for sending the charger in and out of the retort and reversing the scoops, and put into motion by means of an electrically driven motor, or any other convenient method of imparting motion to the drum.

The action of driving the charger into, and withdrawing it from, the retort, is as follows: The charger-scoops having been filled with coal from the hopper, a lever is moved by the machine attendant so as to cause the chain-drum to revolve and make the charger-carriage travel along the frame or track E, until the charger-scoops have completed their full stroke into the retort being charged. The reversal of the lever causes the charger-scoops to be withdrawn from the retort; but before any movement of the carriage takes place (the pulling-out chain being wound round a part of the circumference of the drum), a partial revolution of the drum is made before it can begin to pull the charger out of the retort. This causes the scoops to be reversed through the train of gearing shown, and which is set in motion by the chain-drum. The drum at each end of its partial revolution is prevented from further rotation by projections on the sides of the drum coming into contact with fixed stops on the sides of the charger-carriage.



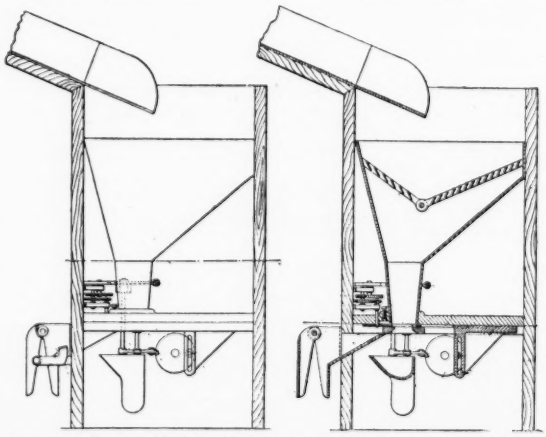
Coin-Counting Mechanism.—Young, A. F., of Cockermouth. No. 9671; April 29, 1903.

This invention relates to apparatus for accurately counting large numbers of coins. It consists in providing coin-counting mechanism comprising means for directing the coins so that they fall and lie flat upon a sliding-piece operated by a handle—one coin being removed from the sliding-piece with each forward movement, and caused to operate counting gear on its way to a receiving bag or other receptacle; means for the removal of small or bent coins, or of coins exceeding the proper thickness; and means for locking the machine when a certain predetermined number of coins has passed into the receiving bag.

According to one modification, the coins to be counted are placed in a guiding-shoot, which is then tilted, and the coins slide into a hopper and fall on a fixed grating. Off this, they fall into a tapered cylindrical tube, a little bigger in diameter at its lower end than the coins to be counted, across the bottom of which is fitted a sliding-piece, upon which the coins fall and lie flat. This slider is given a reciprocating motion by the turning of a handle placed outside the casing of the machine through a crank disc carrying a pin which works in a slotted plate attached to the slider. The slider is so arranged that, when reciprocated, only one coin can pass with it under the bottom of the tube leading from the hopper. This single coin comes in contact with a star-shaped wheel attached to a counting gear, and moves it just so far as to record one on the dial. The slider then returns to its initial position; but the coin is prevented from so doing, and falls into a shoot, from which it slides into a bag. The same operation is repeated until the supply of coins in the hopper is exhausted.

To the star-shaped wheel is geared a disc in such a manner that any suitable number of movements on the wheel caused by the coins passing makes this disc revolve once. A slot is cut in the disc so that a lever or pin can drop into it; the lever being connected through a link to another lever carrying a pin adapted to engage in a slot in the crank disc attached to the handle and slotted plate. When the pins engage with the slots, the machine will be locked, and no more coins can pass to the receiving bag until the mechanism is again released. This is done by pushing in a thumb pin, which releases the two pins from the slots in the discs.

An opening is provided in the slider which is very little smaller in diameter than the coins for which the machine is designed. Through this opening all small coins will drop into a shoot for their reception, and from which they can be led to any suitable receptacle. Any coins that are thicker than those for which the machine is designed, or have been bent, have to be extracted by hand through an opening in the

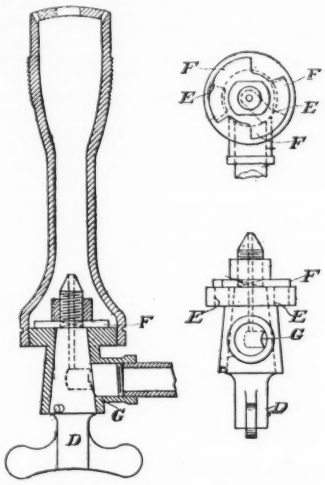


casing specially provided for the purpose. The bag for receiving the coins may be attached to the end of the shoot in any convenient manner—such as by suspending it from the tube forming the shoot, which is carried out beyond the casing and bent vertically downward. The tube is then split and hinged at the top, so that its end can open out or close in, and can he held in any position by suitable means—such as a quadrant lever, eccentric, or spring.

Gas-Burners.—Schill, C. H., and Lane, H., of Hyde. No. 8866; April 20, 1903.

Hitherto difficulties have arisen, the patentees suggest (particularly with gases of low calorific power), when turning on or turning off the gas for igniting or extinguishing, from explosions occurring, which injure the mantles of incandescent burners. There has also been the necessity for occasional adjustment of the air supply according to the quality of the gas being consumed. Their improvement consists in the use of a compound cock with such burners, which controls, with a single progressive movement, both the gas and also the air supply. As the cock is opened, the gas is first admitted to the burner to the maximum extent. The opening movement being continued, the air supply is admitted and gradually increases in volume until the gas is ignited "silently and without shock, and burns with the most efficient air proportions." On closing the cock, the air is gradually shut off; and "it is not until all the air supply has ceased that the gas supply commences to close, and in this manner the light will be extinguished gradually and without lighting-back."

The illustration shows a section of the burner and a plan and elevation of the gas and air inlets.

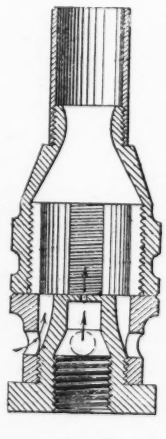


The compound cock D, for controlling the gas and air supply to the burner, consists of a hollow taper plug fitted in a corresponding tapered socket, which is flanged at the top, where it is screwed into the bottom of the burner-tube and has the gas-supply pipe connected to it. The flanged top of the socket has two air-inlets E formed in it; and its upper surface is ground down to form a smooth seating for the air-valve F, which is fixed by a squared central opening on a squared shoulder near the top of the plug and secured there by a nut screwed on the threaded end of the plug. The plug has an opening G in it, to admit gas from the supply pipe through the hollow plug to the burner when the cock is opened.

In operation, as the cock is turned from the closed position, the opening G is first brought opposite the supply pipe, and gas is admitted to the burner; the air inlets E remaining closed by the air-valve F until the gas is fully turned on. Then the continued movement of the cock causes the air-valve to gradually open the air inlets until the air supply has also attained its maximum. In like manner, the reverse action takes place when the cock is turned back from the open to the closed position, and the air is shut off completely before the gas begins to be cut off. In this way, the explosions hitherto caused by slowing down the velocity of an explosive mixture are, it is said, avoided, as "such a mixture no longer exists when the impelling or injecting medium is cut off."

Incandescence Gas-Burner.—Mills, B. J. B.; a communication from Tachon, Joatton, and Co., of Lyons. No. 10,184; May 5, 1903.

The invention consists essentially of a gas and air mixing chimney composed of four pieces. The lowest piece (as shown) serves to inject the gas through an orifice in the centre into the mixing-chamber above. It is externally screw-threaded to receive a metallic ring formed with holes in its lower part (at a lower level than the injection orifice) calculated to give free entrance to the quantity of air necessary to form with the gas a mixture the combustion of which will furnish a blue heating and not illuminating flame, at about normal pressure. The upper part is screw-threaded some way up with a fine thread, and the cylindrical tube formed by this screwed part has formed in it, throughout its entire height, a number of grooves. The third piece is a sort of hood, the interior of which is screw-threaded so that, if screwed home as shown, the holes in the lower part of the burner alone furnish the atmospheric air induced by the column of gas injected through the central aperture. If the piece is more or less unscrewed—as is advisable when the gas supply is at a low pressure—the grooves will be uncovered, and will give free passage to a larger or smaller quantity of atmospheric air, which, coming into contact with the column of gas injected, will be carried by it into the mixing-chamber. But when the pressure of gas is normal, the lower orifices are sufficient to give a suitable mixture. At lower pressures, the injection not having an induction power enough to draw in a sufficient quantity of air through the holes, the orifices referred to will be uncovered, so as to draw in a further quantity of air at the level of the central orifice. This latter air, striking the jet of gas at right angles, mixes intimately with it, and it is possible, by more or less screwing or unscrewing, "to obtain a mixture of gas and atmospheric air, which, as judged by the flame in combustion, will enable the flame to be limited to a blue heating and non-illuminating flame, without any mixture of white or red illuminating flame."



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6162.—O'Brien, M. B., "Improving the illuminating power and destroying the smoke and smell of burning gas." March 14.
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6264.—Nyren, T. B., "Purifying gas." March 15.
6302.—Loomis, B, and Pettibone, H., "Wood gas." March 15.
6303.—Loomis, B., and Pettibone, H., "Producer gas." March 15.
6328.—Wiki, E., "Pumps or blowers." March 15.
6335.—Thuman, F., "Water-gas apparatus." March 15.
6314.—Lloyd, T. J., and Jenkins, G., "Incandescent lamps." March 16.
6524.—Adams, W. W., "Incandescent burners." March 17.
6527.—Thompson, W. P., "Quenching coke." A communication from E. A. Moore. March 17.
6540.—Brookes, A. G., "Enriching gas." A communication from M. M. Makeever. March 17.
6570.—Mackintosh, J., "Gas-turbine." March 18.
6630.—Cars, B., and Herridge, H. S., "Incandescent burners." March 18.
6686.—Blakey, J. W., "Gas-burners." March 19.
6688.—Kitchen, J. G. A., "Incandescent burners." March 19.
6719.—Talbot, B., and Mond, L., "Gas-producers." March 19.
6775.—Parker, C. L., "Production of oxide of iron." March 21.
6791.—Podmore, A. E., and Thomas, J., "Incandescent burners." March 21.
6813.—Evans, H. E., and Wells, T. W., "Incandescent lamp." March 21.
6817.—Riegel, A. E., and Thirion, A. R., "Carburettors." March 21.
6850.—Hubert, H. M., "Incandescent burners." March 21.
6860.—Cutler, S., G. B., & S., jun., "Gas-purifiers." March 21.
6882.—Toogood, H. J., "Charging retorts." March 22.
6891.—Zimpell, K., "Saturator for sulphate of ammonia." March 22.
6907.—Fryer, W. J., "Street-lamps." March 22.
6920-1-2.—Roux, X. M., and Gonin, B. W., "Recovery of ammonia fertilizers." March 22.
6957.—Bowing, J., "Production of gas." March 22.
6981.—Kennedy, R., "Gas-producers." March 23.
6982.—Burleigh, E., and King, A. J., "Production of ammonium phosphate for use as a fertilizer." March 23.
6992.—Place and Sons, Ltd., J., and Place, W. H., "Testing pipes." March 23.
6999.—Forster, A. L., "Gas-producers." March 23.
7007.—Winterflood, J., and Ewart and Son, Ltd., "Gas water-heaters." March 23.
7025.—Holbrook, W. E. & R. E., and Bibbero, M., "Incandescent burners." March 23.
7079.—Whitworth, I. W., "Gas-producers." March 24.
7092.—Halstead, M., and Knaak, F. C. F., "Gas-engines." March 24.
7145.—Imray, O., "Bunsen burners." A communication from J. Pintsch. March 24.
7153.—Bird, H., "Mantle protector." March 25.
7169.—Jameson, J., "Gas-fires." March 25.
7204.—Bokelberg, G., and Sachse, J., "Continuous vacuum distillation of tars." March 25.
7212.—Wakelin, J. F., Weston, J., and Bunn, W., "Gas-cocks." March 25.
7232.—Lee, J. G. S., "Lighting gas-lamps." March 25.
7233.—Lee, J. G. S. "Lamp torches." March 25.
7264.—Thomas, G., "Gas mantles." March 26.
7288.—West, J., "Discharging retorts." March 26.
7289.—Rostin, H., "Gas lighting apparatus." March 26.
7292.—Rath, W., "Loading coal and coke." March 26.
7301.—Langer, A., "Gas-engines." March 26.

The Marylebone Electric Lighting Loan.—The London County Council have given the necessary notice for their Money Bill, which (among other things) is to empower them to lend to the Marylebone Borough Council such sum, not exceeding £1,365,000, as may be required by them for purchasing the undertaking and business of the Metropolitan Electric Supply Company, Limited, as defined by the Electric Lighting Order Confirmation (No. 1) Act, 1901; and to make provision with respect to the period within which any such loan or loans shall be repaid, and the methods of raising the money for them.

New Mallow Gas Company, Limited.—The Secretary and Engineer of this Company (Mr. R. Bruce Anderson, Assoc.M.Inst.C.E.) has reported to the Directors on his second year's working. The quantity of gas sold has increased by upwards of 33 per cent., which, coupled with an advance of 5d. per 1000 cubic feet in price, yields an increased rental of £246, or about 40 per cent. The Company are now selling nearly three times as much gas as they sold when Mr. Anderson entered upon his position; and the business is growing. He speaks highly of the way in which the present Manager of the works (Mr. J. F. Tyndall) is discharging his duties. Though an increased profit was earned last year, Mr. Anderson advises that, in view of the lack of floating capital, no dividend should be declared until the Company's financial condition is put right.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Fire-Brick Making and Gaseous Firing in New Zealand.

Sir,—I was interested in reading, in the "Journal" for the 5th of January, the description of a new industry carried on by the Crystal Palace District Gas Company, which was styled "A New Source of Economy for Gas-Works." You will be interested to know that I started much on the same lines at the gas-works here fully thirty years ago. Having determined the superior quality of our fire-clay, I commenced by mixing it with a certain percentage of pulverized fire-bricks, moulded a certain number of irregular bricks, blocks, tiles, &c., for our own use, and burnt them in a disused arch where a setting of retorts had been taken out.. This was carried on for some time with success, and gave sufficient encouragement to go a step further. Being limited for space, I arranged with one of our local brickmakers to commence making all we required, retorts included. This went on satisfactorily for a while, until he was tempted to adulterate with foreign matter of a nature to act as a flux upon the fire-clay; and this terminated the arrangement. For a few years we imported what we required from England.

In the meantime, we erected branch works to supply a suburb with gas on the north side of the harbour; and having plenty of room on the site, I decided to make another effort to manufacture our own fire-clay goods. We erected a kiln and sheds and the necessary machinery for treating the fire-clay with a percentage of old fire-clay material. Having obtained the services of a thoroughly practical man, we commenced to make all the fire-clay goods we required, including bricks of all the usual shapes and sizes, as well as tiles, blocks, and retorts. This venture proved in every way successful, so much so that other gas companies, learning what we were doing, appealed to us to supply them also. This we did, as far as our limited plant would allow, with every satisfaction. I retired from the position of Manager of the Auckland Gas-Works a few years since; but this branch of the business has still been carried on and extended so as to meet the increased demand.

Many years ago, the late Mr. Drory, of the Imperial Continental Gas Association, when on a tour of the world, visited New Zealand, and spent some time in Auckland. He took great interest in our brick-works, examined the goods and raw material, and pronounced them first class. He remarked that these were the only gas-works he had heard of, excepting their own, where they manufactured their own material; but they were in advance of us, inasmuch as they used gaseous fuel in place of direct firing.

With regard to gaseous fuel, I may mention that in your issue of Jan. 19, 1886 (p. 116), you were good enough to refer to an effort I had made in Auckland to heat gas-retorts by this method, on which at that time there were diverse opinions regarding the superiority of direct firing, the simple generator, and the extended system of regenerative furnaces. The furnaces I described then are still in use; and, being so successful, they were extended through the whole works. During last year I understand they produced upwards of 12,000 cubic feet of gas per ton of coal—with what consumption of fuel I do not know, but for long periods, while we were selling all the coke as produced, we sold fully 11 cwt. of coke for every ton of coal carbonized. I have introduced the same system of generator furnace into a number of gas-works in which I am interested in New Zealand, and with marked success.

I should like to acknowledge how much we are indebted, at this end of the world, to the information contained in the "Journal;" for without this I am sure we should be left all behind. But with its aid we are able to keep abreast of the times, and adopt the latest and most improved methods of producing, distributing, and utilizing gas to the best advantage.

H. Atkinson.

Auckland, (N.Z.), Feb. 16, 1904.

"Jager" v. "Standard" Purifier-Grids.

Sir,—The article under the name of F. D. Marshall appearing in your current issue so distinctly refers to the "Jäger" grid, of which we are the sole manufacturers in this country, and is so obviously intended to encourage the sale of another grid competing therewith, that, although we have no desire to use your "Correspondence" columns for advertising our productions, we beg you will permit us to occupy a small space in your next issue.

With regard to the particular grid which is advertised as the "F. D. Marshall's patent," and called the "Standard," it is we think identical with that illustrated in the circular issued by the Berlin-Anhaltische Maschinenbau-Actien-Gesellschaft, and therein called by the name "Reinigereinbau Bamag," and with respect to which (if we are correctly informed by our German friends) application for protection was made to the German Patent Office and refused.

Mr. Marshall describes some of the experiments that have been made on the Continent in the hope of improving purifying methods; but the list he gives does not by any means include all these various efforts. The result of those in which we are interested has been the development of the ideas that have taken concrete form in the "Jäger" grid and its appurtenances—being an arrangement of purifier devices in which we have the very greatest confidence, and some of the many merits of which Mr. Marshall has been bound to admit in his communication to you, and for which we feel obliged to him.

In describing such of these experiments as Mr. Marshall has made in conjunction with Herr Menzel—whom we understand is associated with the firm of Berlin manufacturers previously referred to—Mr. Marshall uses as illustrations reproductions from some photographs and figured Nos. 2 and 4. These, together with the illustration fig. 3, are, in our opinion, quite delusive, for several reasons. As to fig. 2, it does not correctly illustrate the real arrangement of the "Jäger" grid; and if such a matter as the removal of a bottom from a box representing a purifier charged with oxide were to take place, of course, much would depend as to the manner of its removal—gradually or suddenly. Again, to what extent was the oxide wetted before being used in these experimental boxes?

As to the angle of repose of such granulated material as properly prepared oxide of iron, it is, of course, a factor which has its influence on the manner in which the particles actually arrange themselves. But it is an influence which exerts itself in both directions, and which the arrangement of the "Jäger" grids quite effectively deals with. This is proved by the actual success that has been attained by them in the large number of purifiers in which they have now been fitted (as listed in our advertisement).

As a matter of fact, Mr. Marshall himself suggests one reason for this success, when he describes "a series of superimposed grids placed in the purifier on the 'Jäger' plan when viewed from above present an almost impassable passage for the gas." Of course, this is not true as regards gas; for such a fluid could find its way along any path, either direct or indirect. It is, however, certainly true as regards the oxide whether "viewed from above" or at any line parallel to the bottom. The grids do present an effective barrier to subsidence, and consequent consolidation, of the material they support. Each grid bar carries an equal proportion of the material of uniform width and depth; and thus each small portion subsides equally, and the condition of the oxide throughout the entire volume of the purifier is, to all intents and purposes, absolutely uniform. Herein is one of its great merits.

With regard to fig. 4, it is perhaps possible, if the oxide of iron was indulged with just the proper amount of water, that it might form some sort of arch in some parts of a purifier so filled, if asked to support itself on grid bars placed at intervals of 10 centimetres, (say) 4 inches. But such a phenomenon quite properly deserves the appellations "curious" and "remarkable" which Mr. Marshall accords to it. Certainly, however, if such arches were required to support not only themselves, but a mass of superimposed oxide over such an area as that of a purifier, there would in many parts, of course, be a "giving way" more or less, with the result of offering irregular passages for the gas to travel—in some parts being much less dense than others—with the usual difficulty so often experienced with existing purifiers.

Of course, with the "Jäger" grid such short-circuiting is impossible. The distributing chambers at the one end of the purifier receiving the gas from the inlet pipe, deliver it, by a number of smaller streams, into the several conduits, whence it flows in an infinite number of still smaller streams horizontally, right and left, into the purifying material, to pass again into the receiving conduits, and thence into the collecting chamber connected to the outlet. Thus every atom of purifying material must do its work; and there can be no increment of pressure, whatever depth the purifiers be made. If such an arrangement be compared with one which depends on the stability of an arch made of such material as oxide, surely no argument is needed.

May we inquire, if these arches are to be depended on, why the ordinary kind of sieve is required at all, which its seems from the published illustration is provided at the bottom of each layer of material?

But all these arguments on the part of manufacturers will not convince engineers how to decide upon the usefulness or otherwise of this device or that. We notice from Mr. Marshall's advertisement that at the Gitschinerstrasse Gas-Works, Berlin, he has some "Standard" grids in use. The "Jäger" grids are also in use at the same works; and our German friends have received a second order for a duplicate set of four purifiers since the first set was put into use. The Engineer of the works has reported on them as follows:—

Result of Tests Made on Purifiers Fitted with the "Jager" Grids at the Berlin Gitschinerstrasse Works.

	Horizontal Sieves.	Jäger Grids.	Result.
Gas purified per diem . .	1,271,160	2,577,630	100 per cent. increase
Pressure, four purifiers .	5·8 in.	3·6 in.	38 ,, ,, reduction
Purifying material . . .	780 c. ft.	1234 c. ft.	58 ,, ,, increase
Working contact surface .	394 sq. ft.	719 sq. ft.	83 ,, ,, increase

We presume that, the "Standard" grids having been in use at these same works, a report on similar lines has been received by the makers regarding them. If so, it would be interesting to be able to compare the figures, as showing their work under similar conditions.

Sam. Cutler and Sons.

Millwall, E., March 30, 1904.

The Abrogation of Sulphur Restrictions.

Sir,—As the decision of the Parliamentary Committee in the case of the South Shields Gas Bill may be taken as a precedent in future legislation, I should like to offer a few comments on the evidence, as there appears to be a possible misconception over the general question of sulphur purification *per se*.

Following the evidence, there was, in the first place, the statement in favour of the Company by Mr. Honoratus Lloyd, as to the absence of the so-called sulphur clauses in a large number of gas undertakings. Then follows a more specific statement from the Engineer to the Company, Mr. Thomas Duxbury, that "the sulphur regulations had hindered the progress of the Company, because, whereas people used to take the spent lime from the works, and pay 2s. 6d. per ton for it, now the Company had to pay to get rid of it." Further, Mr. Corbet Woodall says that, "if the sulphur tests were abandoned, the saving would be from 1d. to 1½d. per 1000 cubic feet." He also stated that "the chief reason for getting rid of the sulphur test was the difficulty of disposing of the lime necessary to remove the sulphur—sulphur only to be discovered by analysis." Later on in the evidence, Mr. E. Herbert Stevenson said "the saving in lime purification would be ½d."

The tenor of all this evidence seems to me to have conveyed an impression that the abrogation of the sulphur clauses would mean the discontinuance of lime purification *in toto*, as exemplified in the subsequent remarks of the Chairman of the Parliamentary Committee—viz.; "With regard to the sulphur compounds, having carefully

weighed the evidence in both directions, the Committee have come to the conclusion that it is best to get rid of the foul lime; and therefore they will allow the removal of the restriction as to sulphur compounds." Now it is not the case that the abrogation of sulphur restrictions necessarily means that a gas company ceases to use lime for purification, and therefore to produce spent lime. The main function of lime has always been the removal of carbon dioxide; and the *rationale* of this has been that, as the presence of this compound reduces the illuminating power, it was considered cheaper to remove the carbonic acid by lime than to allow it to remain in the gas, with a possible sequence of employing some form of carburetting material to supplement the deficient illuminating power. This, however, is a question which, with the reduction of the standard illuminating power from 16 to 14 candles, may be subject to reconsideration as a question of economy.

I may add that, in the case of any company considering it advisable to remove the carbon dioxide from the gas by the use of lime, the extra proportion of lime necessary for the practical elimination of sulphur compounds, if conducted on a scientific basis, is comparatively trivial. The total cost of purification is at present less than 1d. per 1000 cubic feet; and this includes sulphuretted hydrogen, which is indirectly a source of revenue, and which under no restriction of sulphur clauses would ever be allowed to be present in the public gas supply.

March 31, 1904. H. LEICESTER GREVILLE.

The Late Mr. Ovington.

SIR,—In your issue of March 22, Mr. Magnus Ohren states that I have made a mistake about the tar-shoot; and I wish to say that the apparatus never was tried at the Sydenham works. An attempt was made to burn tar there on a projected fire-tile; but it failed, and had to be discontinued.

With regard to my position at the Sydenham Gas-Works, what Mr. Ohren states is quite right. I set the first four beds of retorts in the new works. After that, the old foreman (Mr. G. Shoebridge) left; and I accepted the position of head foreman of works, and held it for about seven years—being not only foreman, but also acting as clerk of the new works for the Company. Messrs. Aird and Sons were the Contractors, and Mr. R. M. Christie the Consulting Engineer at that time. The bricklayers' strike occurred when the retort-house walls were about half up; but the Company having inserted a clause in the contract to carry on the work in case of any disturbance in the trade (which was very uncertain at the time), the buildings were completed. This also fell to my lot; so you will see that a retort-setter comes in very handy in time of need.

The statement of Mr. Ohren concerning his brother is altogether wrong. He was the coke clerk at the Sydenham works, and left to take the management of the Longton Gas-Works. Soon after, there was a change of Engineer at the Sydenham works, when I left and went down to Longton to assist Mr. John Ohren; and as tar was then not worth selling, I invented a water-shoot (tar-shoot is not the proper name for it). This was a plain closed water-box, with an inlet and outlet pipe; the tar being led from the tank over the centre of the water-shoot, and with an ordinary lamp-cock to regulate the supply of tar. If the outlet-pipe is carried to the pump which supplies the boiler, it provides hot water for use and saves a considerable amount of fuel. I keep all patterns by me of what I invent; and any manager is quite welcome to the use of them on application to me. My idea of invention is that anyone who originates a useful apparatus deserves the credit of it, if nothing more.

After leaving Longton, I received the appointment of Manager to the Carshalton Gas Company. Mr. H. P. Stephenson was then the Consulting Engineer; and when retiring from that post, he said it would enable me to improve my position and become the Engineer and Manager. I was so appointed, which position I held for 27 years—carrying out all the new works, and alterations to the old works, to the entire satisfaction of the Directors. For this I hold three testimonials. Upon the amalgamation with the Croydon Gas Company, I retired with a full pension.

March 28, 1904. R. GOOD.

Working of Gas Purifiers at Nottingham.

SIR,—I was very much interested in the excellent paper read by Mr. P. Parrish before the Yorkshire Junior Association at Dewsbury, and more especially so, seeing that some of the figures quoted relate to the working of Nottingham purifiers—viz., those showing the analysis of an artificial oxide at each fouling after complete revivification.

In this particular instance, the purifiers were a set of four, of the ordinary water-lute type (30 feet by 40 feet) with 24-inch connections, and passing about 2 million cubic feet of gas per diem. About 100 tons of oxide are placed in two layers in each box; and in no case is air or oxygen admitted with the gas.

As the author states, the peculiarity of the oxide is that it rarely gives any appreciable back-pressure; and the above four purifiers, passing 2 million cubic feet per diem, in series, never give more than 6 inches (and often less than 3 inches) pressure when oxide alone is used.

The sample given is not an exceptional case, but very many similar could be given; and since this artificial oxide has been in use here—except in very wet weather—five to seven times fouling is sufficient for the oxide to pick up 50 per cent. of sulphur.

Nottingham, March 31, 1904. J. H. BROWN.

Registration of Plumbers.—At a public meeting held at Hull last week, under the presidency of Sir John Sherburn (ex-Mayor), the following resolution was passed: "That this meeting cordially approves of the movement for the national registration of plumbers as a safeguard to the public health, and recommends that the Government be urged to deal with the subject during the ensuing session of Parliament; also that copies of this resolution be sent to the First Lord of the Treasury, the President of the Local Government Board, the Home Secretary, and the local and district members of Parliament."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress was made with Bills down to the rising of the House for the Easter recess:—

Bills brought from the Commons and read the first time: Bishop's Stortford and District Gas Bill, Croydon Gas Bill, Ryde Gas Bill, and Sutton Gas Bill.

Bill read a second time: Littlestone-on-Sea and District Water Bill.

Bills read the third time and passed: Gosport Water Bill, Huddersfield Corporation Act, 1902 (Amendment), Bill, and New River Company Bill.

The Harton Coal Company and the Sunderland and South Shields Water Company have petitioned against the South Shields Gas Bill.

HOUSE OF COMMONS.

The following further progress was made with Bills down to the rising of the House for the Easter recess:—

Bills brought from the Lords and read the first time: Gosport Water Bill, Huddersfield Corporation Act, 1902 (Amendment), Bill, and New River Company Bill.

Lords Bill read a second time: Appleby Corporation Gas Bill.

Bills read the third time and passed: Bishop's Stortford and District Gas Bill, Croydon Gas Bill, Ryde Gas Bill, and Sutton Gas Bill.

On Monday last week, a Local Government Board Provisional Order Bill containing an Order granted to the Manchester Corporation with respect to their gas-works, was passed by the Examiners for second reading. Under this Order the Corporation are taking power to spend more money on the undertaking. Originally they obtained permission to borrow £700,000; and in 1893 a further sum of £1,000,000 was allowed. The whole, or nearly the whole, of the £1,700,000 having been expended, they now wish to raise a further £300,000; making the total amount to be spent on capital account in connection with the gas undertaking £2,000,000.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, Feb. 29.

(*Before the* LORD CHIEF JUSTICE *and Justices* WILLS *and* KENNEDY.)

Grand Junction Water Company v. Rodocanachi.—Question of Repairing a Leaky Pipe.

This was an appeal from a decision of the Stipendiary Magistrate at Marylebone, convicting the Company, under the 43rd section of the Water-Works Clauses Act, 1847, for refusing for three days to give a supply of water to certain premises, and inflicting penalties accordingly, but had stated a case for the opinion of the Court.

Mr. MACMORRAN appeared for the appellants; Mr. FINLAY represented the respondent.

Mr. MACMORRAN read the case, from which it appeared that the respondent was the occupier of No. 113, Eastbourne Mews, Paddington, which was a stable, &c., and dwelling-house for two grooms. Early in June last, there were indications of a leakage of water opposite the house; and, on examination by the Company's men, it was found that there was a leak in the communication-pipe belonging to the respondent, close to its junction with the main—the quantity escaping amounting to about 1500 gallons in 24 hours. The ganger of the Company thereupon served the respondent's coachman, on the premises, with a notice requiring the damage causing the leak to be repaired, and intimating that if this were not done, the water would be cut off, but that it would be reconnected as soon as the repair was completed. The coachman took the notice to the respondent's house, but found he had left for the City. He thereupon informed the ganger that he had no authority to get the pipe repaired. The water supply was then cut off, and remained so until the 10th of June, when the repairs were executed by order of the respondent's landlady, and the supply was restored. The time occupied in executing the repair was about two hours. On Saturday, June 6, the respondent wrote to the Company complaining of the water being cut off.

A long argument ensued on the question of who was responsible for effecting the repair in question; Counsel for the Company contending that the obligation lay on the owner or occupier, while the respondent's representative submitted that the Company could and ought to have effected the repair, charging the occupier with the expense.

Their Lordships reserved judgment.

Monday, March 28.

Judgment was given in the case this morning.

The LORD CHIEF JUSTICE said it was an appeal on a special case stated by Mr. D'Eyncourt. The complaint was preferred by the respondent against the appellants for refusing him a supply of water, contrary to section 43 of the Water-Works Clauses Act, 1847. The case was extremely well argued, and raised a point of general importance. It was not necessary to refer in detail to the facts, as to which there was no dispute. It was sufficient to say that on Saturday, June 6,

1903, a leak occurred under the street nearly opposite No. 130, Eastbourne Mews; and when the road was opened the defect was found to be in the communication-pipe, which belonged to the consumer. The questions were, first, whether, in the Metropolis, when a leak was found in a pipe belonging to the consumer, it was the duty of the Company to repair it; and, secondly, did the refusal to supply, in the circumstances stated, constitute an offence within section 43 of the Act of 1847? It was found that the pipe was the property of the consumer or the owner of the premises. Under the section, if the undertakers (except when prevented by certain causes mentioned in another section) neglected or refused to furnish a supply, they were liable to a penalty. After referring to several other sections of the General Act, his Lordship turned to the Metropolis Water Act of 1871, under which, he said, a water company had power to prescribe the fittings to be used—the term "fittings" including, by definition, the communication-pipe. They had also power to give notice to an owner or occupier, in case any defect was found, to cause the same to be repaired; and if the notice were neglected, the company might effect the repairs, and recover the expense from the owner or occupier. Section 32 provided that anyone who wilfully or negligently suffered any fittings to be out of repair was liable to a penalty; and, further, that if a person supplied with water wrongfully omitted to do anything to prevent waste, the company might cut off the supply as long as the cause of injury remained. His Lordship pointed out that neither the Act of 1847 nor that of 1871 contained any express provision giving the consumer the right to open the street to repair a pipe; and this appeared to be one of the grounds on which the conviction was based. Two cases had been cited on the point; but this did not seem to be conclusive. The question still remained: Was a consumer who, having an opportunity of doing so without opening the street, did not choose to repair his own communication-pipe, a person entitled to a supply within the terms of section 43? He did not think any distinction could be drawn between the owner and the occupier. It was contended for the respondent that the duty of repairing the pipe rested upon the landlady. But the Water Company had no means of knowing the relations between the occupier and the owner; and its liability could not depend upon these relations. No question arose in this case as to opening the street, as it had been opened by the Company; and, in the opinion of the Court, the duty of repair was cast, by section 21 of the Act of 1871, on the owner or occupier. They thought the owner or occupier who, after notice had been given to him that the communication-pipe was out of repair, permitted it to remain in a condition in which it would cause waste, was wrongfully omitting to do something to prevent waste; and, under these circumstances, the Company were entitled to cut off the water and cease the supply as long as the injury to the pipe remained unremedied. The appeal must therefore be allowed, with costs.

SHEFFIELD POLICE COURT.—Wednesday, March 23.

(*Before Alderman* CLEGG *and Mr.* JONAS.)

Liability for a Supply of Water by Meter.

To-day, Mr. G. H. S. Carter, a public-house keeper occupying premises in the Haymarket, Sheffield, was summoned for the cost of the water used there, as shown by the meter.

Mr. H. L COATH prosecuted on behalf of the Sheffield Corporation; Mr. MUIR WILSON appeared for the defendant.

Mr. COATH said water was supplied by meter for the purposes of trade; and the account in question was for the quarter ending the 31st of December. He did not understand why defendant disputed the amount, and would not pay what was legally due.

An inspector of meters in the employ of the Corporation gave evidence to the effect that during the quarter named the meter registered a consumption of 218,000 gallons of water on the premises—a larger quantity than had been used in previous quarters. The meter was in good working order. Witness added that he had been informed that there was a leak on the consumer's side of the meter.

Mr. WILSON said he wanted to know where the liability of the consumer began and where it ended. The point at issue was whether it was the duty of the Corporation or of the consumer to repair defects to the pipe on the property.

Mr. COATH contended it was the duty of the owner to repair the pipes, as well as to fix them.

Mr. WILSON said his client had had no beneficial enjoyment in respect of the amount claimed. There had been a leakage; and he contended that it was the duty of the Corporation to show that the water had actually reached his client's taps. Was it the duty of the Water Department to convey the water to the taps, or did the Corporation's liability cease immediately the water left the streets?

An agreement was produced which defendant apparently had not read, though he had signed it, and which his Solicitor had not seen. This document showed that the client was liable for all water which passed through the meter.

An order was accordingly made against the defendant for payment of the sum in dispute.

Welsbach Patents in Australia.

We are informed by the Welsbach Light Company of Australasia, Limited, that they have been successful in an action brought in the New Zealand Courts, at Wellington, against a defendant named Lochhead, who had been exploiting the "G.I.C." mantle. Upon the application of the defendant, a Commission to England was granted. Meanwhile, evidence was taken in Wellington with regard to the Company's patents; and on the return of the Commission to New Zealand in February, the hearing of the case was completed, and the Judge reserved his decision. Judgment has now been given against the defendant, with costs and damages, thereby upholding the validity of the Company's patents. This decision will also apply, it is said, to some half-dozen other defendants, who had agreed to abide by the verdict.

MISCELLANEOUS NEWS.

PUBLIC LIGHTING OF LIVERPOOL.

Annual Report of the City Lighting Engineer.

We have received from the City Lighting Engineer of Liverpool (Mr. C. R. Bellamy, Assoc.M.Inst.C.E.) the report on the work of his department last year.

Mr. Bellamy begins his report with a review of the reorganization of the street lighting of the city. It may be remembered by some of our readers that prior to 1894, the lighting and maintenance of the public lamps were entirely in the hands of the Gas Company; all the burners in use being of the flat-flame type, varying in power from 450 down to 16 candles—equalling in each case 4 candles of illumination for each cubic foot of gas consumed. On Jan. 1, 1894, however, the Corporation took over the lighting and maintenance of the special high-power lamps. With the exception of these, none were reduced in power at midnight; but in that year it was considered desirable by the Lighting Committee to extend the system of midnight reduction to the whole of the city—the view being taken that the maximum rate of lighting was not necessary after midnight. In this, the police concurred. The Gas Company were approached on the matter; but they could not see their way to deal with it in the manner suggested, except at a cost which would have rendered the change uneconomical. The Committee therefore decided to take over the work of lighting and maintaining the public lamps; and the change was commenced on Nov. 7, 1894. By the end of December, the whole of the lighting was in the hands of the Committee, which, under a reorganization, resulted in an annual saving of £7000.

It was further pointed out that the general practice throughout the country was for gas to be supplied for street lighting purposes at a lower charge than to ordinary consumers; and as a result of an arrangement, following a reference to arbitration, the price was reduced by 10 per cent., effecting a further reduction of the lighting charge of £2500 per annum, and making a total reduction of £9500. In November, 1895, it was decided to apply the greater portion of this amount to an improvement of the lighting of the city; and schemes for a reduction of the distance between street-lamps, passage lighting, electric lighting, and incandescent gas lighting were adopted.

Mr. Bellamy then proceeds to give an account of the work carried out. Beginning with electric lighting, he says this was commenced in 1896, and up to the date of his report 185 10-ampere arc lamps had been erected in 4½ miles of streets in the centre of the city and Prince's Boulevard. Under the reorganization scheme, 26 miles of streets were revised, involving the erection of 222 new lamps, 282 substitutions, and 360 removals.

With regard to passage lighting, it appears from the report that prior to 1896 the Corporation did not sanction the lighting of these places except upon the recommendation of the Head Constable that it was necessary for police purposes, and at that time it was estimated that about 1800 passages in the old city were unlighted. The Committee therefore decided to light half of the number, the work to be spread over four years; but by the end of 1898 the work was completed. In 1901, the Committee decided to complete the lighting of the passages in the old city, which were found to number 1244, together with 560 unlighted in the added areas, and subsequently 102 in Garston; and orders have been served on the Cas Company to supply gas to 1996 lamps. The Company are proceeding with the work at the rate of 25 lamps per week; and under this arrangement the passage lighting should be completed by Midsummer.

The portion of the report dealing with incandescent gas lighting is specially interesting. The incandescent gas-burner came into practical use in the city in 1893; but it was not until August, 1894, that the first experiment on a large scale was carried out in the then existing lanterns. Though this resulted in a considerable reduction in the charges for gas, and a large increase in illuminating power, the maintenance charge was very high. Experiments were therefore made to obtain a lamp of special construction which could be used under the best conditions in respect of ventilation and freedom from vibration, and capable of being lighted in the same way as the ordinary lamp, by means of a torch and pole. This resulted in the production of the lamp now in use; and the first scheme of incandescent gas lighting with it was commenced in 1896, when about 40 miles of main streets were lighted with double-burner lamps. The new system proved so successful, that in December, 1898, the Committee decided to apply it to the whole of the streets in the extended city, using single-burner lamps, the operation to be spread over four years. The work, however, was completed by the end of 1901; and 418¾ miles of road are now lighted by 15,446 incandescent gas-burners.

It appears that the boundaries of the city have been extended on two occasions (1895 and 1902) since the taking over of the public lighting, thus adding 167 miles of road, 141 miles of which were lighted by 3270 gas-lamps. The whole of the lighting in these added areas has been reorganized—incandescent gas-lamps having been fixed in lieu of flat-flame lamps, the annual hours of lamplight increased, and all unlighted passages fitted with lamps; while 23¼ miles of new streets have been lighted by means of 674 incandescent gas-lamps. All these improvements have been carried out without raising any capital to meet the first cost, which has been met entirely by the economies effected due to the reorganization. The lighting rate in 1894 was 4d. in the pound. This has since been merged into the general rate; but the total cost of street lighting would now be met by a lighting rate of 3½d. in the pound. The following figures compare the present lighting with that of 1893:—

	1893.		1903.
Mileage of streets lighted	272½	..	436¾
Total number of lamps	11,122	..	17,720
Aggregate illuminating power in million candles	771	..	3,214
Total maintenance charges	£40,881	..	£47,451

It will be seen that while the number of lamps has been increased by 59 per cent., and the aggregate illuminating power by 316 per cent., the total charges are only 16 per cent. greater than in 1893. For the purpose of securing a more direct comparison, the figures relating to the old city may be given in addition :—

	1893.		1903.
Mileage of streets lighted	272½	..	273¾
Total number of lamps	11,122	..	12,793
Aggregate illuminating power in million candles	771	..	2,381
Total maintenance charges	£40,881	..	£35,977

These figures indicate that while an additional mile of street lighting has been added, with 1671 additional lamps, and the total illuminating power increased by over 200 per cent., the charge has fallen by £4904, or 12 per cent.

The city is at present lighted by 17,720 public lamps, made up as follows :—

Street lighting—	
Flat-flame burners	454
Incandescent burners	13,279
Electric lights	185
Total street lighting	13,918
Court lighting	1,004
Passage lighting	2,624
Underground lavatories, &c.	174

The total mileage of roads lighted at the end of the year (irrespective of passages and courts) amounted to 436¾ miles; 4½ miles being lighted by electricity, 418¾ miles by incandescent gas, and the remaining 13½ miles by the ordinary flat-flame system.

Coming to the work carried out last year, Mr. Bellamy reports that 299 new lamps were fixed in passages, and the Gas Company connected 1293 lamps previously fixed; making a total of 1537 out of 1983 ordered to the end of the year. The lighting and re-arrangement of lighting in 4⅞ miles of streets were carried out by the erection of 136 new single incandescent gas-lamps, and the removal of 147 to new positions. The work of fixing incandescent in lieu of flat-flame lamps for the lighting of Garston was completed in the early part of the year; and Mr. Bellamy gives the following figures connected with the change as a useful example of the advantages of the Liverpool system of street lighting: Garston was originally lighted by 481 lamps, the total candle power of which amounted to 8440 candles, the annual cost being £1267 6s. 11d. A report was presented to the Lighting Committee and approved, and the work of substitution carried out, by which the total candle power of the lamps was increased 150 per cent. under a capital expenditure of £1100, with a reduction in the annual charge of £200. Electric lighting has been extended—15 new lamps having been erected; adding one-third of a mile to the length of roads lighted electrically.

In connection with the preceding details, it will be of interest to give a few particulars as to the lamplighting. For this purpose, the city is divided into 14 sections, and the men of each section muster at the most central police station before each operation of lighting, reducing, and extinguishing, under the charge of a foreman, who is in telephonic communication with the inspector, who attends at one of the mustering stations each evening. The time allowed for each operation of lighting at sunset, reducing at midnight, and extinguishing at sunrise, is one hour; the number of lamps in each district depending upon the distance apart. All the rounds are laid out on the assumption that the men will walk at the rate of four miles per hour, with an allowance of ten seconds for dealing with each lamp. The lamps are cleaned once each week. All irregularities, such as the failure on the part of a lighter to complete his work, lamps wilfully extinguished, or blown out, &c., are reported by the police, and transmitted to the mustering station, where extra lighters attend at stated times during the evening for the purpose of relighting all lamps so reported. During May, June, and July, the lamps are lighted at the lower rate only; the midnight visit for reduction being therefore unnecessary. In lieu of this, each lighter is employed for five days on lamp painting. By this means one-third of the lamps and columns in the city are overhauled and painted every year. There are 14 foremen and 175 lighters engaged on the work, the average number of lamps dealt with by each lighter being 110 in the old city and 85 in the suburbs.

The entire maintenance of the columns, brackets, lamps, and fittings is undertaken by the Lighting Department; and the following was some of the work carried out by a staff of 60 mechanics, &c. :—

Incandescent gas-burners adjusted	1,271
Do. cleaned, repaired, and adjusted	2,545
Regulators cleaned and adjusted, &c.	8,495
Regulators adjusted only	1,491
Incandescent gas-burner chimneys cleaned	123,250
Visits paid by inspectors to incandescent gas-lamps	1,225,072
Do. by trimmers to do.	298,668

The supervision and clerical work was carried out by 35 assistants. The total charges in connection with the public lighting of the city, and the supervision of the gas supply for the year, after deducting receipts, amounted to £49,241 4s. 1d.

Disused gas-works buildings at Malvern have been made to serve a useful purpose in connection with the electric lighting and refuse destruction installation which has just been opened by the Chairman of the Urban District Council (Sir Henry F. Lambert, Bart.). The retort-house has been converted into a boiler and refuse destructor house; the boiler and pump room, into a house for the feed-water heater, boiler feed pumps, &c.; the purifier-house, into an engine and dynamo room; and the meter-house, into a stores. The whole of the structural alterations, as well as the boiler seatings and foundations for all of the plant, have been carried out by the Council's own staff. The two boilers are of the Lancashire type, fitted with Wilton's patent furnaces for the destruction of refuse. By means of these furnaces, the whole of the town refuse will be destroyed; and the clinker residue will be used in connection with the sewage purification works. The cost of the scheme is estimated at about £17,000.

BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held on Wednesday last at the London Offices, No. 11, George Yard, Lombard Street, E.C. Mr. CORBET WOODALL presided. Before commencing the business, he expressed the regret of himself and his colleagues that the Chairman (Mr. J. Horsley Palmer) was not in his place. His health was somewhat broken; and he was ordered to Teneriffe, and had not yet returned. They believed, however, that he was on his way home; and he (Mr. Woodall) was sure the proprietors would share the hope of the Directors that Mr. Palmer would come back quite strong again.

The SECRETARY (Mr. H. B. Chamberlain) read the notice calling the meeting, and also the report of the Directors for the six months ending Dec. 31, together with the accounts of the Norwich station, as required by the Company's Act. The following is the report :—

The Directors submit the half-yearly accounts of the Company to Dec. 31 last, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £22,164, after deducting the following sums, omitting shillings and pence: Hull excess profit, £6574; Potteries excess profit, £1662; Trowbridge excess profit, £449; Income-tax, £1258; Hull debenture interest, £2146; Norwich debenture interest, £906; Potteries debenture interest, £381; Trowbridge debenture interest, £166; Interest on debenture stock, £1145—total £14,693.

HULL.—The gas-rental at this station shows an increase of £1831 as compared with that of the corresponding period of 1902; the price of gas having been the same at each period—viz., 2s. per 1000 cubic feet. Coke shows an increase of £2093; tar and tar distilling an increase of £1374; ammoniacal liquor and sulphate of ammonia an increase of £1013. Coals have cost 12s. 6d. per ton, against 13s. 11d. per ton. Coke has realized the same price—viz., 11s. 11d. per ton. The gas sent out was 590,370,000 cubic feet, as against 563,203,000 cubic feet—an increase of 27,167,000 cubic feet, equal to 4·82 per cent. Of this quantity, 48,385,000 cubic feet was sold in bulk to the Corporation for the supply of the Old Town. The profit realized is £6574 in excess of the parliamentary interest. This sum will be invested in Consols; making the reserve fund at this station £30,388.

NORWICH.—The gas-rental at this station shows an increase of £2145; the price of gas having been the same—viz., 3s. 3d. per 1000 cubic feet. Coke shows an increase of £701; and tar and ammoniacal liquor, a decrease of £363. Coals have cost 17s. 3d., against 17s. 10d. per ton. Coke has realized 9s. 3d., as against 9s. 1d. per chaldron. The gas sent out was 230,423,000 cubic feet, as against 221,569,000 cubic feet—an increase of 8,854,000 cubic feet, equal to 3·99 per cent. The profit realized is £4514 10s. 8d. less than the parliamentary interest.

POTTERIES.—The gas-rental at this station shows a decrease of £587; the price of gas having been reduced from 2s. 8d. to 2s. 6d. per 1000 cubic feet from the 1st of April, 1903. Coke shows an increase of £647; tar, an increase of £766; and ammoniacal liquor and sulphate, a decrease of £29. Coals have cost 11s. 8d., against 12s. 5d. per ton. Coke has realized 7s. 3d. against 6s. 1d. per ton. The gas sent out was 204,492,000 cubic feet as against 193,993,000 cubic feet—an increase of 10,499,000 cubic feet, equal to 5·41 per cent. The profit realized is £1662 in excess of the parliamentary interest. This sum will be invested in Consols; making the reserve fund £24,286.

TROWBRIDGE.—The gas-rental at this station shows a decrease of £69; the price of gas having been reduced on the 1st of July, 1903, from 3s. 4d. to 3s. 2d. per 1000 cubic feet—the discounts remaining the same. Residual products have realized £175 more. Coals have cost 15s. 4d., against 15s. 9d. per ton. Coke has realized 11s. 11d., against 10s. 9d. per ton. The gas sent out was 33,828,800 cubic feet, as against 32,699,000 cubic feet—an increase of 1,129,800 cubic feet, equal to 3·45 per cent. The profit realized is £449 in excess of the parliamentary interest. This sum will be invested in Consols; making the reserve fund £901.

HOLYWELL.—The gas-rental at this station shows a slight increase. The residual products realized £5 less. The profit is £213.

The available profit, added to the previous balance of profit and loss, amounts to £55,889. From this sum the Directors recommend a dividend at the rate of 10 per cent. per annum, clear of income-tax. This will amount to £23,000, and leave a balance of £32,889.

The Directors report, with the deepest regret, the death of their esteemed colleague, Colonel Josiah Wilkinson, who rendered valuable services to the Company for a period of 23 years.

Acting under the powers of section 64 of the Articles of Association, they have elected Mr. Leonard Rodwell Wilkinson, the son of their late colleague, to fill the vacancy.

The CHAIRMAN said, in presenting the report for the acceptance of the proprietors, he had a few remarks to make upon the position of affairs at the various stations; but nothing of a very special nature had happened during the half year. At Hull, the consumption of gas continued to grow, although not rapidly. There, as elsewhere, electricity had taken a certain proportion of the lighting which was the Company's, and also—probably to at least as great an extent—the incandescent burner had tended to reduce the consumption of gas. Of course, the Directors rejoiced very much in the latter, because they knew that, by this adoption, the cost of gas was reduced so much to the consumer that the business obtained through it was a very sure and certain one. However, these two causes had operated to check the rate of increase, but equally they were affecting the consumption at a diminishing rate, because, to a large extent, in both directions the demand was satisfied. It was, to his mind at least, remarkable that, with two such causes operating as they had done in the last two or three years, the increase in the consumption of gas should have gone on as it had. The adoption of the Welsbach burner meant, as the proprietors probably knew, that six times the amount of light could be obtained from the same gas, or, if the consumer was content with the same amount of light, he could have for 6d. what previously cost him 3s. In face of figures like these, the Directors felt that their efforts to have reductions of 1d. and 2d. per 1000 cubic feet paled, and became of little consequence. Nevertheless, the Directors would not slacken their efforts to have them. They were advised by their Engineer at Hull (Mr. Young) that two old retort-houses were in need of either large repairs or reconstruction; and, acting on his advice, the Directors had determined upon the latter alternative. The contracts had already been let; and therefore they would have before winter a bench of inclined retorts, suitably housed, which would give more economical results than those now being demolished. So far as the new apparatus was in replacement of

that previously in existence, it would, of course, be a charge against revenue; and to meet this, they had, as the proprietors knew, a fair reserve fund available. At Norwich, as he thought the Chairman had mentioned to the proprietors on a previous occasion, the position was most interesting. They had in the past had two manufacturing stations in the city—the Palace and Bishop Bridge. At the latter, the cost of production was high; and, after the adoption of carburetted water-gas, they discontinued manufacturing at Bishop Bridge altogether. The rate of increase at Norwich was now very considerable, and the Palace works were becoming too small. Rather than revert to the making of expensive gas at Bishop Bridge, they had removed practically the whole of the apparatus, excepting the retort-house, from the Palace station to Bishop Bridge; so that in the future, they would manufacture the gas at the Palace works, and purify and store it at another station, with an interval of some 1000 yards between them. The retort-benches at the Palace works were partly ready, and the balance were rebuilding. Mechanical stokers were installed; and it was hoped to effect there a considerable saving in cost. The accounts for the current half year would give an indication as to how far these expectations were being realized. Here, again, the expenditure had been considerable; and a large share would have to be borne by revenue. Unfortunately, they had not at Norwich a reserve to meet this charge. They must look to their savings on the new plant to provide it. He was glad to say that, in the opinion of the Directors, Mr. Glover, the Engineer, had shown great resource and ability not only in designing the new works, but also in conducting the operations of the Company during the process of transformation. To carry on the works and maintain the supply under such conditions as had obtained for the last eight or ten months, had been a matter of great anxiety and great difficulty. This went without saying. As he (the Chairman) had already said, they must write off a great portion of this cost from revenue; and they had begun this in the accounts now under consideration by writing off £2000 on this account. He should, by-the by, have mentioned that at Hull the half year was punished to the extent of about £500 by reason of the very considerable reduction in the charge for meter-rent. At the Potteries, the new works—rendered necessary partly by the growth of business and partly, and much more considerably, by the sinking of the ground due to the getting of coal underneath—were approaching completion. After they were commenced, the Directors received notice from the colliery owners that the new works were being erected at the risk of the Company, as the coal was about to be worked under that land also. After careful consideration and consultation with legal advisers, the Directors decided to apply to the Courts for protection, by means of an injunction to restrain the getting of coal; and at least they would have, as the result of this application, a clear definition of what were the respective rights of the coal owners and the Company. There was nothing to say in regard to Trowbridge except that they had now there, in Mr. Chamberlain, who had been at Holywell hitherto, a new Manager who they had no doubt would devote fresh energy to the development of business at the station. Mr. Sainsbury, their late Manager, had retired after a long term of excellent and devoted service. Generally, he thought he could safely say that the Company were in a flourishing condition. They had suffered from the depreciation of the value of securities that had gone on, as was palpable, everywhere; and, consequently, new capital had to be raised at a somewhat high rate. The Directors were meeting this to a large extent by issuing debentures; and he therefore thought they ought to find that their new capital was costing them, as a charge for interest and dividend, not more than the old. At the Potteries, during the current half year, they had placed £15,000 of debentures, and at Norwich they had placed £12,000—practically the whole of it locally, which the Board regarded as conducive to the interest and stability of the Company. The Directors had, as the proprietors were aware, offered some £60,000 of debenture stock of the Company, and of this a certain portion was not subscribed. By-and-by they would have to remind the proprietors of this, and give them a further opportunity of subscribing it. In conclusion, he moved the adoption of the report and accounts.

Mr. Frederick Wilkin seconded the motion, which was unanimously carried.

Moved by the Chairman, and seconded by Mr. Leonard R. Wilkinson, a dividend for the half year of 20s. per share, clear of income-tax, was declared.

Proposed by Mr. Graham Wilkin, and seconded by Mr. Bernard F. Harris, a vote of thanks was passed to the Chairman and Directors.

The Chairman, in responding, said he ought to have announced that they had received a letter from Mr. Palmer, in which he desired whoever took the chair to express his regret at his absence. He (Mr. Woodall) was sure that their Chairman did regret very much not being present to perform his duty.

Mr. R. S. Gardiner, in moving a vote of thanks to the Secretary and the other officers of the Company, said he did this with all the greater pleasure because of his intimate acquaintance with the work that they did for the Company. He had no hesitation in saying that, whether connected with the London office or the engineering offices at their various stations, their officers performed their duties in a way that was most creditable to them and to the Board who selected them, and of great advantage to the Company generally. The Directors themselves must, and did appreciate every week how much their own responsibilities were lightened by the satisfactory way the officers performed their duties and by their devotion to the Company.

Major-General W. T. Corrie seconded the motion; the Chairman adding that the half year—in fact the whole year—had been an exceptionally trying one for their officers, and they had come through it exceedingly well.

The Secretary's acknowledgment ended the proceedings.

Water Purchase Question at Shepton Mallet.—The Shepton Mallet Urban District Council have declined the offer of the Water Company to purchase their undertaking at the price of £16,585, which, with the necessary costs, would have been increased to £18,885. A largely-attended meeting of ratepayers, convened by the Council, has been held at which this decision was confirmed.

SAN PAULO GAS COMPANY, LIMITED.

A Progressive Policy.

The Annual Meeting of this Company was held on Monday last week, at Winchester House, Old Broad Street, E.C.—Mr. D. M. Fox in the chair.

The Secretary (Mr. G. H. Rogers) having read the notice convening the meeting,

The Chairman moved the adoption of the report and accounts. In doing so, he said the past year had been an eventful one in the history of the Company, from the fact that, during the last three months of that period, the full effect of the contract with the Government of Feb. 11, 1902, had begun to be realized. It might be well for him to repeat some of the most important stipulations of the contract. First, the price of gas was to be reduced for public and private lighting alike, from 170 reis to 140 reis per cubic metre. This reduction of price to private consumers took effect as from March 1, 1902; while for public lighting the price was to remain at 170 reis until all the public lamps had been converted to the incandescent system. Secondly, the illuminating power of the gas was to be reduced from 17 to 14 candles; but, until the whole of the public lamps had been converted from flat-flame to incandescent burners, the illuminating power was to remain at 17 candles. Thirdly, the whole of the public street-lamps were to be converted from flat-flame to incandescent burners before the end of September, 1903. The effect of the above conditions during the past year had been: First, that during the whole year the price of gas for private consumption had been 140 reis per cubic metre in place of 170 reis; that during nine months the price of gas for public lighting had been 170 reis, and for three months, or since September, when the work of conversion was completed, 140 reis per cubic metre—being an average price of 162·5 reis, as against 170 reis for the year. Then, the illuminating power had been for nine months at 17 candles, and for three months at 14 candles. The conversion of the whole of the street-lamps in the city and suburbs—4094 in number—was completed by Sept. 13 last to the satisfaction of the Government officials; so that since that date the whole of the city had been lighted by the incandescent system at the reduced rates and candle power. Therefore, for the last three months of the year, the full effect of the new contract had been realized in its entirety. The shareholders might be sure that the Directors did not enter into such a commitment—involving, on the one hand, a considerable expenditure of capital, and, on the other, a serious diminution in the price of gas—without much anxious thought; and only under the firm conviction that, unless a vigorous and liberal policy were pursued, the Company would suffer severely (perhaps incalculably would not be too strong an expression) from the competition of the Electric Power and Light Company. At the beginning of this year, their anxiety was increased by the fact that the State of San Paulo was under a cloud of depression, owing to the desperate condition of the coffee market, which made the outlook very gloomy indeed. The lowering of the price of gas, too, to private consumers was not for some time realized by the public; and there was consequently little, or at any rate no corresponding, increase in the sale of gas to private consumers to compensate for the loss caused by the reduction in price. As a natural consequence of this deplorable state of things, the first half-year's working did not, in the opinion of the Directors, justify the payment of an interim dividend of more than 3 per cent., as against 4 per cent. But during the last six months, owing to the rise in coffee, there had been a marked revival of prosperity in the State generally; and consumers had begun to find out and appreciate the benefit conferred upon them by the supply of good and cheap gas, with the usual result that, as the statement of accounts showed, the net profit in San Paulo at the close of the year was practically identical with that for the previous year. It was with great satisfaction, therefore, that the Board were able to recommend the payment of a final dividend of 4 per cent.; making 7 per cent. for the year. Although the result of the working had been so satisfactory and encouraging, still, bearing in mind that the current year would be the first entire year under the new conditions, the Board had deemed it prudent not to make the total distribution more than 7 per cent.; and he might add that it would be their policy to make this the normal rate of dividend in the future—any way, for some years to come—and to strengthen the financial position of the Company as much as possible by adding to the reserve fund. Regarding the new contract, although the Government of the State of San Paulo had made an excellent bargain for themselves and for the inhabitants, the Company, on their part, had also obtained modifications in their favour of certain clauses in the original contract of October, 1897, that formerly somewhat hampered them. Now that the illuminating power of the gas had been reduced to 14 instead of 17 candles (which was far too high a standard to maintain at the altitude of 2500 feet above sea-level, besides being not required for the incandescent burners), they looked to considerable economy in the manufacture by the saving of cannel, and obtaining more gas out of the coal to recoup some of the loss on selling gas at a low price, and to meet the cost of maintaining the incandescent burners. Above all, they knew they had won the goodwill of the authorities and of the public whom they served; and he should be indeed very much mistaken if they did not reap the reward that, as a rule, followed the adoption of a vigorous and liberal policy. At the last meeting, when this work was in contemplation, he ventured to predict that San Paulo would be one of the best lighted cities in the world. This had come to pass. There were in the streets of the city 4094 lamps all fitted with incandescent gas-burners, many of them of high power, and maintained, by an excellent staff, in a high state of efficiency. It was in this way they had been able to hold their position against their powerful rival supplying electricity by water power. In the year, the sale of gas for public lighting was 52,159,000 cubic feet, against 53,182,000 cubic feet the previous year. This reduction in the consumption, with an increase of 343 lamps, was due to the smaller consumption of the incandescent burner. On the other hand, the private consumption was 104 million cubic feet, against 91 millions the previous year, or an increase of 15 per cent.; the number

of private consumers being 443 more than in 1902. The revenue account showed that the receipts for gas amounted to £78,715, against £74,745 the previous year—an increase of nearly £4000. It was noteworthy that, although the receipts from public lighting fell off by nearly £2000, due entirely to the reduction in price on a more or less fixed consumption of gas, the sale of gas to private consumers for light and cooking was nearly £6000 larger than in 1902, which was an increase of 13 per cent. —a result which was most encouraging. A few days ago a telegram was received, stating that for the first two months of the year, or to the end of February, the private consumption had increased by 47,000 cubic metres; and the net profit by over £500. Residual products showed a falling off in the year from £18,889 to £16,367, due to the depreciation in the value of coke. The railways had been induced to try coke for locomotives and other purposes at reduced rates; while the retail price had been slightly raised without affecting the demand in the city for cooking and other purposes. Turning to the balance-sheet, it would have been noted that the reserve fund had been drawn upon to the amount of £7153 for the liquidation of the expenditure on the transformation of the public lamps, and other obligations incurred by the contract lately entered into. The Board trusted that this encroachment on the fund would be made good in a short time. He also referred with satisfaction to the success of the issue of £40,000 debentures in June last, which were exclusively subscribed by shareholders. The Board had taken out policies in assurance offices guaranteeing the payment of £38,000 of debentures at the expiration of the concession in 1927. The annual cost of this insurance would be £1000. Complimentary reference was made to the zeal and tact shown by the Company's able Manager in San Paulo (Mr. Richard Gray), and then came a few words on the fatal accident to Mr. Sparkes, the Company's Chief Technical Officer, as recorded last week. Mr. Sparkes (who was 32 years of age) was Mr. Gray's right-hand man, and full of promise. As this was the third valuable servant the Company had lost through being killed by electric currents, no doubt measures would be taken by the Government and the Electric Light and Power Company to prevent the possibility of such a lamentable loss of life.

The MANAGING-DIRECTOR (Mr. A. F. Phillips), in seconding, said he thought it would be evident to all the shareholders that San Paulo was an example that, after all, gas was the most suitable of all general illuminants. If they would only remember that the Company had to take coal from Newcastle some 7000 or 8000 miles by sea to a port in Brazil, then to convey it some 50 miles by rail to a point 2500 feet high, they would find that gas was there not only able to hold its own, but even to show a development as against electricity generated by water power. He thought this was evidence that, if boards of directors would only adopt a similar policy, and study the interests of their consumers, gas could always hold its own against electricity.

The resolution was unanimously adopted.

On the motion of the CHAIRMAN, seconded by Major H. N. WEBB, a dividend of 4 per cent., free of income-tax, was declared; making, with the interim payment, 7 per cent. for the year.

The outgoing Directors (Major H. N. Webb and Mr. J. R. Tyndale) and the Auditors (Messrs. Cash, Stone, and Co.) were re-elected.

The usual votes of thanks concluded the proceedings.

ANTWERP WATER-WORKS COMPANY, LIMITED.

At the Annual Meeting of this Company last week—Mr. Easton Devonshire presiding—the Directors reported that the income, from all sources, amounted to £54,325, as compared with £50,542 for 1902; and after deducting the ordinary expenses, there was a balance of £36,111. Adding the undivided profit of £2098 brought forward, and the interest on investments £560, gave a total credit of £38,770, against which had been charged debenture interest and income-tax for 1903, the contribution to the reserve account of 5 per cent. on net profits, discount and commission on debentures, £1104, the interim dividend of £10,500, at the rate of 7 per cent. per annum, the transfer to the sinking fund for redemption of debentures of £1000, and for that of the share capital £6250, and the Directors' extra remuneration (under the Articles) of £786. The sum of £14,215 was then left, out of which the Directors recommended that a balance dividend for the six months to Dec. 31 be paid at the rate of 7 per cent. per annum, free of income-tax. This would absorb £10,500, and leave a balance of £3715 to be carried forward. The Secretary (Mr. J. M. Hamilton) having read the notice convening the meeting, the Chairman moved the adoption of the report and the recommendation as to dividend. In doing so, he said they had again to deplore the loss of a Director. Last year, he had to refer to the death of Mr. Norman. This year, he was sorry to say, they had lost Mr. William Blaber, who had been a Director for 22 years, and was the Chairman for several years. Mr. Blaber's experience as a water-works administrator dated from about 1840. He was a good man; and he died in December at the great age of 86. The shareholders, he was sure, would all sympathize with the Board in their loss. To fill the vacancy, they had appointed Mr. John Kennedy, in whom they had an excellent business man. From the report and accounts, it would be seen that the progress of the Company's affairs had been most satisfactory. The increase in the contracts for last year, as shown by the Manager's (Mr. Kemna's) report, was 990, which was the highest figures since 1885. The income, too, had doubled in the last ten years. This was a very satisfactory state of things; but it was still more satisfactory to be able to say that the scope for increase was not less than before. The Directors recommended that the dividend should be 7 per cent., carrying forward the sum (which some shareholders might consider rather large) of £3715. This 7 per cent. was at the same rate as the interim dividend, but ½ per cent. more than last year's dividend. However, with regard to the amount carried forward, the Board thought their policy was a wise one; and they hoped the shareholders would approve of it. Things were bad just now; and it was not the time to borrow money or to realize investments. They had yet a great deal of money to spend. Work had just been started on the new pumping-station at Luithagen. The contracts had all been placed; and they would have nearly £30,000 to expend on these works, which should be completed by May next year. Towards this expenditure, it was proposed to issue further debentures to the extent of £20,000. Mr. George Evans seconded the motion, which was unanimously carried. The retiring Directors (Mr. Evans and Mr. W. H. Blaber) and the Auditors were re-elected. Before the proceedings concluded, Mr. Kemna, by the aid of charts, gave some interesting information as to the past history and progress of the concern.

GAS AND ELECTRIC LIGHTING IN MASSACHUSETTS.

According to the Nineteenth Annual Report of the Board of Gas and Electric Light Commissioners of Massachusetts, which has lately been presented to the Legislature, there were 951 inspections of gas during the year ending June 30, 1903, including those of gas supplied by municipal plants. The number of companies showing deficiency in candle power was 37, against 23 in 1902 and 6 in 1901. The average illuminating power, not including oil-gas companies, was 17·91 candles, against 18·6 in 1902 and 19·5 in 1901. The average illuminating powers of coal gas (37 companies) was 17·45 candles, against 17·29 and 18·09 candles in the two previous years; of water gas (12 companies) 21 06 candles, against 22·16 and 22·91 candles; and of mixed coal and water gas (15 companies), 18·76 candles, against 19·15 and 19·66 candles. The number of companies having sulphuretted hydrogen in their gas was 20, against 17 and 6; having excess of sulphur, 28, against 25 and 4; and having excess of ammonia, 9, against 5 and 5. The average illuminating power of oil-gas companies was 50·8 candles, against 51·2 and 50 9 candles. The number of companies showing sulphuretted hydrogen was 3, against 2 and 3. The municipal electric lighting plants had for the year a total income of $191,016, against $157,390 in 1902; expenses of $283,063, against $218,696; and an apparent loss in operating account of $92,016, against $61,306. The gas account of municipal plant shows as follows: Income, $147,177; expenses, $100,896; apparent profit, $46,281, against $40,212 in 1902. A summary of the financial operations of all the companies in the State shows: Income, $9,542,940; expenses, $6,953,033; surplus, $735 476. For 1902 the figures were: Income, $7,968,098; expenses, $5,713,272; surplus, $703,073. Two of the companies appear not to have earned expenses, and 26 others have not earned sufficient to warrant the declaration of any dividend. The receipts from gas sold by meter show an increase of $149,473. The receipts from sales for public lamps have increased by $5722. The value assessed by the local assessors of the gas plants is $25,000,000. The average price paid by consumers for coal gas is $1·06 per 1000 cubic feet, and for oil gas $4·62 per 1000 feet. The average for coal gas in 1902 was $1·07; in 1901, $1 08; in 1900, $1·10; and in 1899, $1·12. The average price has been gradually reduced from $1·72 in 1886.

PRICE OF GAS IN ITALIAN TOWNS.

In a recent issue of "L'Industria," a table was given showing the price charged for gas in the principal towns in Italy. We reproduce the figures (in centimes per cubic metre) for some of the more important places; and it is interesting to note the variations in them. Though in certain towns the works are rather primitive in character, and no care is taken to utilize the residual products, large profits are made, owing mainly to the absence of competition. In the following places the works are in the hands of companies:—

Town.	Lighting.	Heating.	Engines, &c.	Public Lamps.
Alessandria	25	20	20	18
Bergamo	19	—	15	10
Brescia	18	—	15	10
Cagliari	30	20	20	—
Cremona	24	20	—	—
Florence	30	—	18 / 22	25
Genoa	20	—	14 / 16	—
Messina	33	24	—	—
Milan	16	—	—	—
Naples	28	—	17	—
Palermo	20	18	20	22
Rome	21	—	16	17
Turin	14	—	—	12
Venice	33	26	28	12·3
Verona	30·3	26	26·2	16·7

The following are communal supplies:—

Town.	Lighting.	Heating.	Engines, &c.	Public Lamps.
Bologna	25	23	20	—
Como	18	—	—	14
Leghorn	19 / 26	20	10 / 20	14·5
Padua	18	—	16	—
Pisa	24	18 / 21	—	—
Spezzia	25	20	—	—
Vicenza	22	10	18	—

Consolidated Water-Works Company of Rosario, Limited.—The report of the Directors of the Company for the year ended the 31st of December last shows that the gross revenue, after making provision for bad and doubtful debts, amounted to £44,728, and the working expenses to £19,216; leaving a balance of £25,512. After providing for debenture stock and other interest, and placing £1000 to the depreciation fund and £2812 to the reserve fund, there remains an available balance of £13,706. After providing for the preference dividend, the Directors recommend one of 4 per cent. on the ordinary shares, absorbing £4200, and leaving £3269 to be carried forward.

WATER AND GAS CHARGES AT SOUTHPORT.

In the financial year 1902-3, there was a deficit of more than £7000 on the undertaking of the Southport, Birkdale, and West Lancashire Joint Water Board, which involved an additional rate of 4½d. in the pound for Southport. For the year just closed, a still further deficit is reported, involving a loss which can only be made good by a contribution of 6d. in the pound. It is calculated that out of the deficit the consumer gets a benefit to the extent of at least 1½d., on account of the lower charges made for water, and the fact that the rates were computed on the poor-rate assessment. If the 3 per cent. basis on which the Water Company's undertaking was purchased had held good throughout the transaction, and the old charges had continued, there would not have been anything to pay during the first few years. As it was, the Water Board had to give about £33 for shares of the nominal value of £10; bringing up the purchase price to nearly £900,000. When they came to borrow, it was found that a considerable amount of the mortgages could not be obtained at once, and recourse had to be had to the bank.

A very different state of things is reported with regard to the gas undertaking. Last year the Gas Department handed over £8000 towards the rates, besides wiping off slight accumulated deficits and building up a small reserve. The make of gas in the year just closed shows a fairly considerable increase compared with the year 1902-3, while in the cost of materials there was a substantial drop, though it was not so marked as in the previous year. The disturbing factor is the change in the price—viz., 4d. per 1000 cubic feet less. The materials employed in producing gas of the lower candle power are not so expensive as the others; but the saving in this respect is not 3d. per 1000 feet, and is probably only a little more than 2d. It is confidently hoped, however, that the Gas Committee will be in a position to promise £8500 this year, though it is not anticipated that any reduction will be made in the price. The net charge is 2s. 6½d. per 1000 cubic feet; and it is considered that 2s. 6d. is a very fair average figure indeed for Lancashire.

INCREASED GAS STORAGE FOR NEWBURY.

It having become necessary to erect a new gasholder estimated to cost £8500, the Newbury Town Council have decided that application be made for the sanction of the Local Government Board to the borrowing of £1500, the balance of £10,000 authorized to be raised under the Provisional Order of 1893, and that the necessary steps be taken to obtain a further Provisional Order for the borrowing of a sum of £10,000 for the purposes of the gas undertaking, to be taken up as required. From some figures adduced by the Manager (Mr. W. R. Davey), it appears that in 1899 the daily output of gas was 208,000 cubic feet; and this had gradually increased until, in 1903, it had risen to 249,000 feet. By 1905, when the new gasholder will be ready, it is anticipated that the output will be 270,000 cubic feet. The capacity of the present holder is only 160,000 cubic feet; while that of the new one will be 200,000 feet. In 1899, the capital employed per 1000 cubic feet of gas produced was 18s. 4d.; but last year it was only 13s. 6d. The increased capacity of the gasholder, and a continuation of the rate of progress experienced in late years, will necessitate improved plant; while much of that now in use will need renewing in the course of a few years. The improvements and renovations which will require attention in the immediate future will amount to £11,500.

COMBINED GAS AND ELECTRICITY WORKS AT HONLEY.

The opening ceremony of the Honley electric light installation was performed on the 21st ult. by the Chairman of the Council (Mr. E. Crowther), who was presented with a gold key by the Engineer of the scheme, Mr. A. B. Mountain, of Huddersfield.

The building containing the generating plant forms part of the gas-works, and was formerly a shed used for storage purposes. The main plant consists of one 22-kilowatt Westinghouse dynamo, driven by a 35 brake horse power Westinghouse double-cylinder vertical gas-engine. The large plant will generate 40 kilowatts; and the small dynamo, required for supplying current during the period of light load, has an output of 8 kilowatts. This is driven by the same engine, which is constantly running for pumping purposes for the gas-works, so that there is practically no need for any attendance. The switchboard is capable of regulating the energy generated by the three dynamos and controlling the supply for three feeders and the street lights. The mains consist of overhead bare copper wires supported by steel poles. The pressure is 200 volts; and the plant is capable of supplying 2500 8-candle-power lamps. The total capital outlay will be about £2400.

At the dinner which followed the opening, Mr. Crowther gave a short history of the undertaking. He said that some four years ago there was talk of a private company introducing electric lighting into Honley. The ratepayers would not have another private company; and they held a meeting and recommended the Council to look into the question of electric lighting and see what could be done. At the Council meeting, he urged the installation being run in conjunction with the Gas Company, of which he was then, and had been for fourteen years, Chairman. It might be, and probably was, said that he had an axe to grind. The Gas Company were, however, quite prepared to treat, and ready to sell out at a reasonable price. A price was therefore fixed, the Council met, and within a few months the offer was

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 18.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	19½—20½	..	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13½—14½	+½	5 3 5
200,000	5	Nov. 12	6½	Bombay, Ltd. . . .	5½—6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 7
380,000	Stk.	Feb. 25	12	Brentford Consolidated	222—227	..	5 5 9
300,000	,,	,,	9	Do. New . . .	167—172	..	5 4 8
50,000	,,	,,	5	Do. 5 p.c. Pref. .	127—132	..	3 15 9
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb. .	103—108	..	3 14 1
220,000	Stk.	Mar. 10	10⅔	Brighton & Hove Orig.	202—207	..	5 3 10
246,320	,,	,,	7⅔	Do. A. Ord. Stk. .	142—147	..	5 5 5
460,000	20	Oct. 15	10	British.	38—39	..	5 2 7
100,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c. .	112—117	..	5 2 7
165,700	,,	,,	4⅓	Do. do. 3½ p.c. .	85—90	..	5 0 0
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd	10½—11	..	6 7 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
150,000	20	Mar. 10	8½	Cagliari, Ltd. . . .	21—23	..	7 3 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Feb. 25	5⅛	Commercial 4 p.c. Stk.	102—107	..	4 17 3
556,485	,,	,,	5	Do. 3½ p.c. do.	97—100	..	5 0 0
442,947	,,	Dec. 11	3	Do. 3 p.c. Deb. do.	84—87	..	3 9 0
800,000	Stk.	Dec. 30	7	Continental Union, Ltd.	107—112	+4	6 5 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—135	..	5 3 8
575,000	Stk.	Feb. 25	5⅛	Crystal Palace Ord. 5 p.c.	108—113	..	4 14 4
60,000	,,	,,	5	Do. 5 p.c. Pref. .	115—120	..	4 3 4
112,533	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	134—137	..	3 13 10
486,090	10	Jan. 28	10½	European, Ltd. . . .	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Feb. 11	4⅛	Gas-light and Coke } 4 p.c. Ord. . .	87—89	..	4 18 10
2,600,000	,,	,,	3⅛	3½ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4	4 p.c. Con. Pref.	104—107	..	3 14 9
4,193,975	,,	Dec. 11	3	3 p.c. Con. Deb.	85—87	..	3 9 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	88—93	..	3 7 6
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16—17	..	6 9 5
3,800,000	Stk.	Nov. 12	10	Imperial Continental .	197—200	+5	5 0 0
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	97—99	..	3 10 8
165,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	103—108	..	5 11 1
561,000	Stk.	Feb. 25	10	Liverpool United A .	208—210	..	4 15 3
718,100	,,	,,	7	Do. do. B .	158½—160½	..	4 7 3
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.	108—110	..	3 12 9
75,000	5	Dec. 11	5	Malta & Medn., Ltd. .	4¼—4¾	..	5 5 3
560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb.	101—105	..	4 15 3
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 12	3½	Monte Video, Ltd. . .	9—10	..	7 0 0
1,515,892	Stk.	Feb. 26	4½	Newc'tle & G'tesh'd Con.	106—107	..	4 4 1
405,025	Stk.	Dec. 31	3½	Do. 3½ p.c. Deb.	93½—94½	..	3 14 1
300,000	Stk.	Nov. 26	8	Oriental, Ltd. . . .	135—140	..	5 14 4
600,000	5	Mar. 29		Ottoman, Ltd. . . .	5—6*	+¼	5 16 8
					* Ex div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	Jan. 14	6⅛	Ply'mth & St'house 5 p.c	121—126	..	4 17 2
851,070	10	Oct. 15	7	River Plate Ord. . .	11½—12	..	5 16 8
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	92—94	..	4 5 1
250,000	10	Mar. 29	7	San Paulo, Ltd. . . .	10—11*	..	6 7 3
135,000	Stk.	Mar. 10	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	235—237	..	4 4 5
523,498	,,	,,	10	Do. C	234—236	..	4 4 9
116,106	Stk.	Mar. 29	5	Shrewsbury Ord. 5 p.c.	107—110*	+½	4 10 11
6,150,000	Stk.	Feb. 11	5⅜	South Met., 4 p.c. Ord.	117—120	+1	4 8 10
1,832,700	,,	Jan. 14	3	Do. 3 p.c. Deb. . .	85—88	..	3 8 2
380,940	Stk.	Nov. 12	5	Southampton Ord. . .	105—110	..	4 10 11
87,950	,,	Jan. 14	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
120,000	Stk.	Feb. 25	6	Tottenham and Edmonton } A. 5 p.c. B. 3½ p.c.	112—117	..	5 2 7
313,020	,,	,,	4½		93—98	..	4 11 10
182,380	10	Dec. 30	8	Tuscan, Ltd.	⅝—9	..	8 17 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
745,872	Stk.	Mar. 10	5	West Ham, 5 p.c. Ord.	94—97	..	5 3 1
				WATER COMPANIES.			
781,517	Stk.	Dec. 30	12	Chelsea, Ord. . .	350—355	..	3 7 7
150,000	,,	,,	5	Do. 5 p.c. Pref. .	142—147	..	3 8 0
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	132—137	..	3 5 8
175,785	,,	Mar. 29	4½	Do. 4½ p.c. Deb. .	130—135*	..	3 6 8
1,720,560	Stk.	Mar. 23	8	East London, Ord.. .	217—222*	+1	3 12 1
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb. .	133—138	..	3 5 3
1,524,288	,,	,,	3	Do. 3 p.c. Deb. .	87—90	..	3 6 8
700,000	50	,,	10	Grand Junction } 10 p.c. max.. 4 p.c. Deb..	136—139	..	3 11 11
310,000	Stk.	Mar. 29	4		113—118*	..	3 7 10
708,000	Stk.	Feb. 25	10	Kent	315—320	..	3 2 6
160,000	,,	,,	7	Do. New, 7 p.c. max..	217—222	..	3 3 0
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max..	312—317	..	3 9 5
406,200	100	,,	8½	Do. 7½ p.c. max..	228—233	..	3 13 0
350,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb..	113—118*	..	3 7 10
500,000	100	Feb. 25	10	New River, New Shares	365—375	..	2 13 4
1,000,000	Stk.	Jan. 28	4	Do. 4 p.c. Deb..	116—119	..	3 7 3
902,300	Stk.	Dec. 30	7½	South-wark and } Ord. . . . 7½ p.c. max. 5 p.c. Pref. .	273—278	..	2 14 0
126,500	100	,,	7½		215—225	..	3 6 8
489,200	Stk.	,,	5		144—149	..	3 7 1
1,019,585	,,	Mar. 29	4	Vauxhall } 4 p.c. A Deb.	113—118*	..	3 7 10
1,155,066	Stk.	Dec. 11	10	West Middlesex. . .	293—298	+1	3 7 1
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	130—135	..	3 6 8
200,000	,,	Mar. 10	3	Do. 3 p.c. Deb. .	87—90	..	3 6 8
					* Ex div.		

accepted without any bantering. As soon as the transfer of the gas-works was completed, the Council went in for electric lighting. They had to get an Act of Parliament for the transfer of the gas-works, and a Provisional Order for electricity. The Council commenced the lighting service a month ago; and they intended to go on with a through night service, and, if required, a day service.

ELECTRICITY v. GAS AT DARTMOUTH.

The effect of the competition of the electric light was seen in the report presented at the annual meeting of the Dartmouth Gas Company last Tuesday. The receipts for the year were £595 less than in the previous twelve months; and though the expenses had been cut down by £441, the profit balance showed some diminution. The Chairman (Mr. R. W. Prideaux) was, however, able to congratulate the shareholders on the progress which has been made in the fixing of prepayment meters. He said that during the period covered by the report, 180 have been fitted; and though there had not been a full year's return, the result was very satisfactory. Some customers for lighting had gone; but, on the other hand, great strides had been made in the sale of gas for heating and cooking, the results of an exhibition held in the town having been very encouraging in this respect. In order to provide for the new outlay, it would be necessary to have more money. It was proposed to increase the nominal capital of the Company from 700 shares of £8 each to a like number of £10 each. The additional amount would not be called up, but £2000 would be raised on debentures. The Directors had secured a contract to lay on gas to the new Naval College; and though it was for use in only a small portion of the building, they hoped to show its value for cooking and heating, and so increase its consumption. A dividend of 9s. a share (7 per cent.) was declared.

THE "LANCET" ON GAS AND ELECTRIC LIGHTING.

Gas Bills and Consumers' Health.

In the issue of the "Lancet" for the 26th ult., the following remarks were in a leading article on "The Gas Bill and Health."

It is surprising how very few people know how to use gas properly for illuminating purposes; and the point is of some importance, since the healthy state of the atmosphere of a living-room must obviously bear a relationship to the amount of gas consumed. The consumer is more concerned perhaps about the gas bill, though any economy that he may effect must necessarily reduce the output of the gas, and minimize any vitiating effects upon the atmosphere. As a matter of fact, the vitiating effect of a gas-burner upon the air of a room, assuming that the gas is burning at a minimum rate and giving a maximum light, as it should do, is practically a negligible quantity. The electric light, of course, has no effect whatever upon the air. But it cannot be denied that electricity is much more expensive than gas, however economically it may be used; and the supply of electric current cannot be controlled so easily as gas. The electric light cannot be turned down like a gas-light, and hardly anyone understands the principles of an electric meter; while all are tempted to doubt whether it records the truth, and they are helpless to decide the question for themselves. In economical households where the electric light is used, care is taken to switch off the current as soon as the light is not needed. In consequence of this attempt at economy, the greater part of a house is often left in darkness. It is a curious result of electric lighting that many houses have the appearance at night of being tenantless because only the rooms that are occupied are lighted, and these are often situated at the back of the premises. If gas lighting were better understood, people who are compelled to study economy somewhat closely would find that the use of gas would save them much anxiety. In this matter, however, they are not helped by the gas companies, who pursue, in spite of the competition threatened by electric light systems, the utterly short-sighted policy of encouraging waste. When a householder succeeds in reducing his gas bill by paying intelligent attention to the principles of gas lighting, the company's officials immediately suspect that the meter is wrong. The gas companies at first resisted the Welsbach system because it consumed much less gas and gave a much better light. Now they encourage the system, on the principle that any system is better than none. Gas is still enormously wasted; and it would be quite safe to say that half the Welsbach lights in London, if turned down a little, would give increased light, and would consume less gas. In very few houses is it the rule to find the gas burning properly. In the kitchen and cellar naked flames, enormously distorted by unnecessary pressure, are to be found roaring like a blow-pipe; the flames are feebly luminous, when with less than half the quantity of gas, a much more luminous flame could be obtained. Even where incandescent burners are in use, the flame is found to be usually much too high. A greatly increased luminosity would be gained on reducing the flow of gas, and the outflow of products of combustion would be very materially diminished. The house in which the maximum illuminating effect of gas is secured thus should have the smallest gas bill and the healthiest rooms; yet people still go on paying the price of ignorance, while the great gas corporations, in scooping in the price of waste, are blind to the future interests of their industry.

The Rockford (Ill.) Gas Company have made a novel Leap Year proposal. They have announced that they will give to every 1904 bride a gas-range worth $18 (75s.), and connect it to their mains free of charge (provided one has been laid in the street where she will live), on condition that she will burn at least $15 (62s. 6d.) worth of gas during the remaining ten months of the year.

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THE RATING OF RESERVOIRS.

Deputation to the President of the Local Government Board.

A few days ago, the President of the Local Government Board (Mr. Walter Long, M.P.) received in one of the Committee rooms of the House of Commons, a deputation from the Association for Promoting the Equitable Rating of Reservoirs, who wished to urge upon him the advisability of altering the law under which water companies are rated in respect of their reservoirs at only one-fourth of the full rateable value. The Association are supported by the County Councils of Middlesex, Surrey, and Essex; and their case was presented in a long statement, in the course of which it was pointed out that the existing system was based on the ground that reservoirs constructed and used for the storage of water are to be regarded only as "land covered by water," within the meaning of sections 211 and 230 of the Public Health Act, 1875. It was submitted that if Parliament passed a law authorizing the assessment of the Metropolitan Water Board's undertakings to all rates at their full annual value, it would do an act of justice, and afford a great relief to the areas of storage without doing any injustice or making any substantial difference to the vast and teeming area, known as "the limits of supply."

Sir F. Dixon-Hartland, Bart., M.P., in introducing the deputation, remarked that the law as it now stood was a crying evil in all parts of the Thames and Lea Valleys; and the deputation was representative of 450 Urban District Councils, and the County Councils of Middlesex, Surrey, and Essex. Taking the case of Hampton as an instance, he said the loss to the ratepayers by the present law was no less than £4375 per annum; and this threw an unfair burden upon the other ratepayers living in the parish. The trend of public opinion was that storage reservoirs were the proper and best methods for supplying people with water in the future, and therefore the evil complained of would be a growing instead of a diminishing one. The deputation were aware that Mr. Long had well-studied the subject, and they hoped he would give them the views he entertained upon it, and answer any questions that might be put to him.

Mr. Long said there were really two questions before them. One was the existence and extent of the evil of which the deputation complained, and the suggestion that some remedy might be found in the Assessment and Valuation Bill which he was to introduce on behalf of the Government. The Bill was not one in which it would be possible to make the alteration proposed. As those who were acquainted with rating affairs were probably aware, the valuation and assessment authority was not the authority who were charged with the making of the deductions which had to be made either under the Public Health Act or any other which differentiated between different classes of property in regard to rates. The deputation complained of a grievance that arose under a section of the Public Health Act, by which certain properties were rated at a 75 per cent. discount on the Poor Law Assessment, under the term "land covered with water." They knew that the construction put upon these words was that reservoirs used for trade purposes were included in them. This construction was the result of a case duly heard in the Courts; and it was what they knew generally as "judge-made law." The difficulty, however, was not met by a valuation and assessment authority; and so it was obvious that it would be outside the scope of a Valuation and Assessment Bill. He gathered from the remarks made by his two honourable friends at the interview he had with them that there was an impression that in some cases reservoirs were valued at a sum that did not actually represent the proportion they ought to bear to the capital of the undertakings. If this were true, the Bill he was introducing would, he hoped, remedy that portion of the evil, because his object in bringing it in was to secure greater uniformity and exactitude in the valuation and assessment of property. But it would have no effect upon the precise difficulty the deputation were there to complain of—that was to say, the application of the section of the Public Health Act that there should be a 75 per cent. discount on one particular class of property. This difficulty could only be remedied by an amendment of the Public Health Act. It was impossible for him to say whether or not he considered their grievance was an established one. Except the communication made to him by his friends Sir Frederick Dixon-Hartland and Mr. Bigwood, he had nothing to go upon. He had no record in his department of complaints made to him except this communication; and they were, of course, aware that there would be a strong feeling on the other side. They were there as representing spending authorities. It was their desire that they should be able to get as much money as they could out of the areas they governed and were responsible for. But there were, on the other hand, people who owned and managed this particular kind of property; and before he could express any definite opinion, it would be necessary for him to hear what they had to say. If they wanted to remedy the evil by legislation, the only time to do it would be when there was a Public Health Bill before the House of Commons. He hoped there would be one this session; and that would be an opportunity for getting in such an amendment as they required. When such a Bill was introduced, they would have an opportunity of hearing the views of those opposed to it, as well as of those in its favour. It would not be possible to limit discussion to one case alone, though he could see that possibly they could establish a case for reservoirs that could not be established for other classes of property. Their only chance was to move an amendment to the Public Health Bill when it was before Parliament, and they would elicit not only opinions from those who were in their favour, but from those who were against their contention. It seemed to him that the greatest hardship was to be found in cases where the reservoir did not exist for the benefit of the locality in which it was built, but for the purpose of supplying water to another area. This, of course, was an obvious loss to those who had to pay the rates, because if such an area contributed the full rate on houses, there would be less to be contributed by ratepayers of the district. There was this loss also—there was no compensation

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in the form of supplying something which was really essential, and which if supplied to the district might be included as some set-off against the loss of rateable value. It would be more difficult to make out a case if a reservoir formed part of the water supply of a district. But where the reservoir had nothing to do with the area concerned, and was put in a certain place simply because it had been found to be the most convenient or suitable one, he thought this could be shown to be a grievance; and he suggested that the deputation should devote their attention to pressing that side of the case, in order that in the special instances mentioned some relief might be afforded them.

Mr. Scott (the Secretary of the Association): Is it certain that a Bill to amend the Public Health Act is to be brought in?

Mr. Long: I thought I had made that clear. I am going to bring in a Bill this session; and the proper course would be for a member concerned to put down an amendment.

Mr. Bigwood (M.P. for the Brentford Division) thought that, after the very lucid statement by Mr. Long, they need not take up any more of his time. They thanked him for the kind way he had received them, and for the full and complete manner in which he had gone into the subject.

Sir F. Dixon-Hartland remarked that Mr. Long had admitted that the construction placed upon the particular section of the Public Health Act was what was called "judge-made law," and that the Act was not intended to take in these reservoirs.

Mr. Long: I did not say "not intended." I do not know what Parliament intended; but the Courts evidently thought the term "land covered with water" applied to these particular reservoirs.

After some questions bearing upon the scope of the Assessment and Valuation Bill referred to by Mr. Long, the deputation thanked the right honourable gentleman, and withdrew.

LIVERPOOL CORPORATION WATER SUPPLY.

Inauguration of a New Reservoir at Prescot.

Last Thursday, an important addition was made to the water-works of the Liverpool Corporation, by the inauguration, by Lady Derby, of the new reservoir which has been constructed at Prescot on land forming part of the family demesne abutting on the reservoirs already existing there. The work was commenced on Dec. 22, 1900, by Lord Derby cutting the first turf; and since then an average of 400 men have almost constantly been employed by the Contractors (Messrs. Holme and King) in carrying it out. The reservoir is capable of holding 121,950,000 gallons; the total contents of the ordinary draw-off level being 110,213,000 gallons, or equivalent to four days' supply for Liverpool and the out-districts served by the Corporation. The area of the water surface of the new reservoir is upwards of 27 acres; and the mean depth to the overflow level is 15 ft. 3 in. The maximum depth of the trench for the foundation of the embankment is 80 feet, and the minimum depth 13 feet—the average being 28 ft. 4 in.; while the total earthwork excavated was 262,312 cubic yards. The company present at the inaugural ceremony included, in addition to Lord and Lady Derby and the Lord Mayor and Lady Mayoress (Alderman and Mrs. Hampson), Alderman W. Burgess (Chairman), Mr. J. T. Wood (Deputy-Chairman), and members of the Water Committee; the Town Clerk (Mr. E. R. Pickmere, M.A.), the Water Engineer (Mr. Joseph Parry, M.Inst.C.E.), the Assistant Water Engineer (Mr. T. Duncanson, M.Inst.C.E.), and other officials; and Mr. C. W. King, Mr. F. King, and Messrs. Harvey and Ralph (the Resident Engineers), representing the Contractors.

Alderman Burgess, in the course of a few introductory remarks, said that rather more than three years ago some of them met near that spot on the occasion when Lord Derby was good enough, by cutting the first turf of the new reservoir, to inaugurate the work which had now been brought to a successful termination. They would readily understand that where a large volume of water was brought in pipes from a considerable distance to supply the needs of a populous locality, there was always a liability to temporary stoppages on the pipe-line for repairs and from other causes; and it was therefore needful that storage accommodation should be provided in the neighbourhood of the place to be supplied, if a constant service was to be maintained. When the Rivington water was brought into Liverpool, sixty years ago, storage reservoirs were consequently constructed at Prescot in which about 87 million gallons could be stored, though perhaps not more than 60 million gallons had been available for use in Liverpool. This was found in practice to be sufficient as long as they had Rivington water only coming forward; but they were advised by their Engineer that with the Vyrnwy supply, which eventually would be four times as great as that of Rivington, the storage accommodation they possessed was utterly inadequate. They therefore decided to construct an additional reservoir, and Lord Derby, when it was found that the most suitable site was on that spot, though it involved the sacrifice by him of a portion of his park, added to the obligation they were under to him and to his predecessors by meeting them in every way with great courtesy and consideration. The expenditure on the reservoir had been £138,365, and the work had been carried out by a Liverpool firm of Contractors, Messrs. Holme and King, under the supervision, of course, of the Corporation's Chief Engineer, Mr. Parry, and his resident assistant, Mr. Davidson. The reservoir was completed to permit of water being allowed to flow in for testing its water-tightness on the 21st of December last. The water was allowed to rise slowly, so that the soundness of the work could be tested at every point until the reservoir was finally filled to the overflow level on the 18th of February, since which date it had been full to that level. When they began the work with the help of Lord Derby, he reminded those who were present of the intimate connection of his Lordship's family with the Liverpool Water Supply; for the first public water supply came, more than a hundred years ago, from the Bootle springs

1904

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on his property, and engaged the attentive interest of the Lord Derby who was then living. He (the speaker) was sure they were all delighted to find that Lady Derby was willing to finish what Lord Derby began; and he would ask her ladyship to accept of a key with which she would be able to turn the water from the new reservoir into the pipes which would convey it to Liverpool.

Lady Derby then, amid applause, turned on the water. The key, which was of solid silver in the form of a turncock's key, bore, in addition to the Derby crest and the Liverpool coat of arms, the following inscription: "Liverpool Corporation Water-Works. Presented to the Right Honourable the Countess of Derby, on the occasion of the Opening of the New Reservoir at Prescot. March 30th, 1904."

The LORD MAYOR proposed a vote of thanks to the Countess.

Lord DERBY, replying on behalf of her Ladyship, said it gave them both pleasure to be present and assist in adding to Liverpool's water supply. With regard to the reservoir just opened, the Engineer (Mr. Parry) had been most careful, and the Water Committee most considerate, in allowing the outline to be so varied that it had not affected the features of natural scenery as viewed from the other side. He hoped this would always remain, as it certainly would in his mind, not only as a recollection of a great work done, but of one done in a manner which made things easy for those who lived in the vicinity. He should like to be allowed to bear testimony to the kindness of his friend Mr. Parry and his assistants, as well as of the Contractors and their men, for the manner in which the work had been conducted. It had been carried out in a way about which there could be no complaint.

The proceedings then concluded.

Charge for Street Lighting at Rochdale.—The Gas and Electricity Committee of the Rochdale Corporation have decided that gas for street lighting shall be sold to the General Purposes Committee at 1s. 9d. per 1000 cubic feet, which is practically cost price. For many years past gas has been furnished for the public lamps without charge, and without any records appearing in the accounts; but the Corporation have now adopted the suggestion, which it will be remembered was made last year by Messrs. Ashworth, Morley, and Co., after auditing the accounts, that the gas so supplied should be charged for. The cost is estimated at between £5000 and £6000 a year.

Exmouth Gas Company.—The progress of this Company continues to be most satisfactory; and Mr. J. Palmer, who presided at the annual meeting on Wednesday last, was able to congratulate the shareholders on the fact that the past year was the best in their history. A further reduction of 2d. per 1000 cubic feet was announced as from the taking of the meter indices at Lady-day; making the figure 3s. 8d. per 1000 cubic feet, or, with the rebate of 5 per cent. for prompt payment, a net price of 3s. 6d. It was decided to pay dividends of 10 and 7 per cent. on the two classes of shares, together with such additional dividend as will reimburse the shareholders for income-tax on the dividend payable.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Two circumstances induce me to revert to the subject with which I began my "Notes" last week—the lighting of Edinburgh streets by incandescent gas-lamps. The first is a communication which I had on Thursday from Mr. W. R. Herring, the Engineer to the Gas Commission. Mr. Herring acted with promptitude in the matter. Receiving the "JOURNAL" on Wednesday, he at once directed the Superintendent of the Fittings Department to let him know whether it was a fact that condensation was collecting on the interior of the globes in the lamps in Glenogle Road. The reply of the Superintendent was that he went to Glenogle Road that night to examine the lamps, and was at the one nearest the Canonmills end of the road at 7.40 p.m.; and there was condensation inside it a little more than half-way up the globe. He examined every lamp from there to Stockbridge, and there was not another with any damp in it. Counting from Stockbridge, there were 18 of them beautiful and clean; and all these but two were giving a fine light. The others were not clean; but they were not all equally dirty—some showing signs of moisture having run down them. One of them was not lighted at all. He returned to see them at 9.30 p.m., and still found them dry, including the one which was damp at 7.40. The other one referred to had now the bottom jet of the "Rocket" lighter burning; and he got a pole with which he turned the main stopcock on full, which action turned off the bye-pass. Owing to not being turned full off, it must have lighted down through the large tube of the "Rocket" lighter, after he had passed it at 7.40, as it was not burning at that time.

The other circumstance was that on Wednesday a Sub-Committee of the Cleaning and Lighting Committee of the Edinburgh Town Council had before them two proposals for the improved lighting of those thoroughfares in the city which are not at present lighted by electricity. One motion was that the whole of the streets should be lighted by electricity. The Committee considered that such a scheme was at present unworkable, and that the lighting proposed under it would be quite inadequate. After hearing a report by the Inspector of Lighting, the Committee resolved, on the lines of a motion by Bailie Mallinson, that within the next five years the ordinary gas-lamps in the city should be converted into incandescent lights, with square lanterns instead of the present globes.

The latter circumstance would almost make it appear as if my "Note" of last week had been inspired. But it was not; it was the result of observation which accident placed in my way. The decision of the Sub Committee shows that the official mind must have been impressed, as mine was, that the lighting obtained from the large lanterns was not at all times satisfactory. Mr. Herring's communication bears out what I observed—that condensation did form at times—for one lamp was damp on that particular evening, and others showed marks of moisture

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SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
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SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
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having run down them. Of course, whether moisture would deposit within the lanterns would depend upon the temperature of the evening. It would not be found every night; but its presence at times is sufficient to warn lighting authorities that, with single burners, the lantern is not a suitable one to use in a climate like that of Scotland.

The Town Council of Glasgow on Monday adopted the proposals of the Special Committee on the Lighting of the Public Streets, which were given in the "JOURNAL" for the 15th of March (p. 713). Mr. Cleland, in moving the recommendations of the Committee, said they thought their scheme was somewhat comprehensive. The Committee asked for a new equipment of lanterns, which meant a considerable charge; but they did not think it desirable that the charge should be placed to capital account. They recommended the Corporation to authorize a suspense account over eight years—one-eighth being taken off each year. The scheme would involve an annual expenditure of £13,057, or an increase in the lighting area of 0·7d. in the pound—which would be well spent in this way. The Committee had studied the question for two years; and they believed that they had arrived at a satisfactory solution. Mr. W. F. Anderson suggested that the expenditure might be decreased by reducing the amount of lighting on car routes after midnight, and by seeking powers to alter the minimum charge for lighting private stairs and courts. Mr. Cleland replied that the question of obtaining parliamentary powers to increase the charge for private lighting was before the Committee; but when they sought powers previously to do this, it was opposed. Although there might be a slight economy in reducing the light on the car route, the Committee did not think it would justify them in taking such a retrograde step. Mr. Kennedy said that in some English towns gas was being used of as low an illuminating power as 16 candles. The candle power in Glasgow was about 20. Each candle cost about ½d.; and if they were to reduce the quality of the gas to about 16 candles, the saving effected would recoup them for any extra charge arising from the rearrangement. He hoped that this point would not be lost sight of, and that, in conjunction with the Gas Committee, the Committee would be able to effect a large saving on the cost of street lighting. The recommendations of the Special Committee were unanimously adopted. These, it may not be out of place to call to mind, provide for the entire abolition of lighting by flat-flame burners, and the substitution for them of incandescent gas-burners; double burners being used in thoroughfares where there are tramcar lines, and single burners, of varying size, in all other thoroughfares. Such an immediate awakening to duty as the Corporation of Glasgow have shown in this matter is not often witnessed in connection with any public body.

The stamping of gas-meters in Dundee was before the Magistrates of that city on Wednesday. It was introduced by Bailie Mechan, who said that hundreds of gas-meters were brought to the city every year, which were stamped in the places where they were made. They had provided expensive plant in Dundee for doing this; but it was standing idle while the work, which could be quite easily attended to by their own Inspector, was being done in Edinburgh or Glasgow by Corporation officials. Were the work done in Dundee, a sum of perhaps £60 a year would be earned by their own Weights and Measures Department. The Gas Manager approved of the work being done in the town, but suggested that it should be at the gas-works. There was, however, plenty of accommodation on the Corporation premises, which were convenient for the shopkeeping classes. The meters could be sent direct by the makers to the Inspector in Dundee, so that the only extra cost would be the cartage of the meters from the Inspector's office to the gas-works. The Magistrates ordered that in future all meters supplied to the Corporation should be stamped by their own Inspector in Dundee.

On Saturday last, Sheriff Maconochie, in the Edinburgh Sheriff Court, issued his judgment in an appeal from the Sheriffdom of Linlithgow, in an action by E. P. Smith, a heating and lighting engineer, of Forth Street, Edinburgh, against Alexander Macdonald, of Viewforth Hotel, South Queensferry, and Mrs. Macdonald. Pursuer contracted to introduce a system of lighting by aëro-gas into defenders' hotel in August last; and in this action he sued for £55 as due under the contract. The defenders maintained that the installation fitted up was not in accordance with representations made by the pursuer, and that on trial it proved a failure. In his reply, pursuer said the defenders were satisfied with the installation, and made no complaint till payment was asked. Sheriff-Substitute Macleod, at Linlithgow, after proof, gave his decision in favour of the pursuer. Sheriff Maconochie has reversed it, and has given the defenders absolvitor.

The Perth Town Council on Monday agreed to the proposals for the borrowing of £80,000 for gas, water, electricity, and other purposes. Of the total sum, £20,000 is for the gas undertaking. This amount, it was explained by Mr. Cuthbert, the Convener of the Gas Committee, was intended for the provision of main-pipes and gas stoves and meters, and to provide for the carrying on of the department during the next fifteen years. There was no intention of extending the gas-works.

The Parliamentary Commission resumed their sittings in Edinburgh this week, and proceeded to consider the application by the Corporation of Arbroath for power to introduce a gravitation water supply to the burgh. Mr. C. Kincaid Mackenzie, K.C., for the promoters, stated that the present water supply is derived from wells, and that the proposal of the Corporation was to take water from the Noran stream, a tributary of the South Esk. The Local Government Board had intimated that they would hold the Corporation responsible for introducing a proper supply of water. It had been estimated, on an average of three consecutive dry years, that the Noran would yield 4 million gallons of water per day; and the promoters submitted that if they were to allow 1⅓ millions per day for compensation, they should be permitted to take the rest. The cost of the scheme was estimated at £80,000. The Corporation sought powers to borrow £90,000. The proposal was to erect a reservoir of 50 million gallons capacity, at a cost of £20,000, which would hold water equal to a supply for 170 days. There was opposition on the part of the owners of mills and salmon fishings upon the stream, as to the quantity of compensation water to be allowed.

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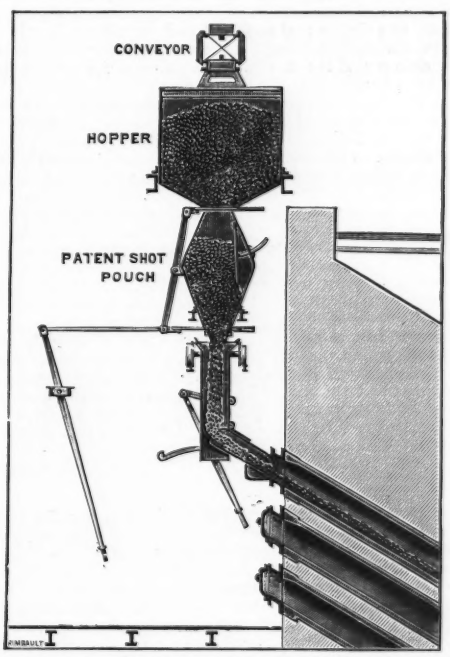

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On the second day of the hearing, an agreement was come to under which the supply to Arbroath is to be 1¼ million gallons daily, and the compensation water is to amount to 625,000 gallons per diem. There was also opposition on the part of local traders upon the subject of rating. The proposal of the Corporation was that traders should be assessed upon one-half of their valuations. This was considered to be too heavy a burden, when regard is had to the charges upon traders in other towns. The Commission decided that traders should be assessed upon one-fourth of their valuation. They passed the preamble of the measure. The Order will prove a very heavy burden upon the community—the assessment being estimated at not less than 1s. 9d. in the pound. The changes introduced by the Commission make the burdens still heavier; and there is speculation already afoot as to whether the Order will ever be put in force, or whether another attempt should not be made to procure a supply of water from the Corporation of Dundee—a proposal which was under consideration last year, but which was rejected by the Arbroath Corporation.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 31.

Sulphate of Ammonia.

So far there has been no recovery from the dullness which has prevailed since the beginning of February; but prices have been about maintained—the closing quotations being £12 10s. per ton f.o.b. Hull, and £12 11s. 3d. to £12 12s. 6d. per ton f.o.b. Liverpool and Leith. The manure season, both on the Continent and in the United Kingdom, being exceptionally late, improved demand in these directions is generally expected in April; but as yet it has not made itself felt. In the forward position, buyers remain altogether indifferent; and quotations must be considered as nominal only.

Nitrate of Soda.

In this article there has been no recovery on the Continent from the recent set-back in prices; but there has been some improvement in demand. On spot, values are a shade easier; the closing quotations being 10s. 1½d. to 10s. 4½d. per cwt., according to quality.

LONDON, *March* 31.

Tar Products.

The markets for tar products generally have been very quiet, doubtless owing to the approach of the Easter holidays. There is nothing fresh to advise in pitch; and prices remain in about the same position. There have been several inquiries from South Wales; but consumers do not appear to be willing to pay the prices asked by makers and dealers for forward delivery. Small sales are reported in Belgium for October-December delivery, but at very low prices; dealers being evidently bent upon securing forward business, even at lower quotations than are at present ruling. There is certainly rather more pitch offering, especially for early delivery; makers being evidently desirous of clearing out any stocks they may have on hand before the hot weather sets in. Some small transactions in benzol have taken place for home consumption, at prices equal to about 9½d. to 9⅝d. f.o.b. In solvent naphtha, there is really nothing doing; and very low prices indeed are quoted for delivery in the North. The demand for special qualities appears to have fallen off for the time being. The creosote market is decidedly dull. Small sales are reported in the North at 1¼d.; while it is stated that even less than this has been accepted in Manchester for early delivery. In London, the market is decidedly weaker, especially for early delivery. One or two small sales of anthracene have taken place for early delivery, at prices varying from 1⅜d. to 1⅝d., according to quality. There is nothing fresh to advise in crude carbolic. Makers still hold at 2s. for 60's; but consumers will not pay more than 1s. 10d. to 1s. 10½d., so that business is rather at a standstill for the time being. In crystals, English makers appear very firm in their ideas at from 7d. to 7½d., according to packages. The German makers are fairly well sold for prompt delivery, but are rather anxious to secure orders for July-December, for which period they are quoting very low prices, as compared with those asked by English producers.

The average values during the week were: Tar, 18s. to 23s. Pitch, London, 33s. to 33s. 6d.; east coast, 32s. to 32s. 6d.; west coast, 31s. to 32s. Benzol, 90 per cent., 9⅜d. to 10d.; 50-90 per cent., 7d. Toluol, 6½d. to 7d. Crude naphtha, 3d. to 3¼d.; solvent naphtha, 7d. to 8½d.; heavy naphtha, 10d. to 10½d. Creosote, London, 1¼d. to 1 1/16d.; North, 1¼d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60 per cent., 1s. 11d. to 2s. Refined naphthalene, £5 to £8; salts, 22s. 6d. to 24s. Anthracene, "A" quality, 1⅜d. to 2d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The sulphate of ammonia market has been very quiet during the past week, and closes with a decided absence of business, doubtless owing to the holidays. Beckton still maintain their price at £12 15s., in any position, but they do not find business offering on these terms. The South Metropolitan Gas Company report having sold at £12 15s., their own special terms, but are not now sellers of any further quantity at this price. The Hull market remains quiet at about £12 10s for prompt delivery; but there is an absence of inquiry for forward. There is very little business doing at Leith for either prompt or forward delivery. Prices are nominally £12 11s. 3d. to £12 12s. 6d. In Liverpool, some small sales are reported at £12 10s and £12 11s. 3d.; but there is little demand for either prompt or forward delivery.

Otley Water-Works Loan.—The Local Government Board have agreed to the borrowing by the Otley District Council of a further sum of £40,000 to complete the new water-works. The loan has been granted for 35 years, which will mean an annual repayment of £2040. If, however, the period were sixty years, the yearly amount would be only £1690—a difference of £350, which is equivalent to a 3d. rate. The Council have agreed that a deputation shall wait on the Board, and endeavour to get the term extended to sixty years.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

Pits generally throughout Lancashire have been closed since Thursday; and it is exceptional where they will get back into full work until about Wednesday of this week. This extended stoppage of production is helping collieries to clear off a good deal of surplus—where this had been accumulating at the pits—as consumers in many cases have been anxious to get in supplies to carry them over the period during which the pits are closed. As to the condition of trade generally, this remains anything but satisfactory from the coalowners' point of view. The better qualities of round coal move off but moderately for house-fire purposes, and are plentiful on the market. The question of prices has been a good deal discussed; but it is not at all probable that, for the present at least, there will be any official reduction. The position in Lancashire is that list rates, which were reduced in May last, have not recovered from this reduction during the past winter; and an attempt will no doubt be made to carry on through the summer if possible without any further official reduction. A good deal, however, will depend upon the course of prices in other districts. Best Wigan Arley coal remains about 13s and 13s. 6d. up to 14s. per ton at the pit, seconds Arley and Pemberton four-feet 11s. and 11s. 6d. to 12s. 6d., and common house-fire coals quoted 9s. 6d. to 10s. 6d. Common round coals still meet with but a slow sale for ironmaking, steam, and general manufacturing purposes. This class of fuel is hanging at most collieries, with low-cut quotations to effect sales, especially where competition has to be met from other districts. Common steam coals could be bought at 7s. 9d. to 8s. 3d. per ton at the pit, with better sorts at about 8s. 6d. to 8s. 9d.; while for shipment as low as 7s. to 7s. 6d. is reported for prompt clearance sales. Apart from some special qualities of engine fuel, slack is becoming more plentiful on the market, and for ordinary descriptions very low prices are ruling. Best Lancashire slacks remain steady at 6s. to 6s. 6d., medium sorts about 5s. to 5s. 6d., with common slack to be bought from 3s. 9d. to 4s. and 4s. 6d. per ton at the pit. In the Derbyshire district, the price is as low as 1s. 6d. to 1s. 9d. per ton.

Northern Coal Trade.

The holidays have increased the scarcity of coal, and have made the prices in some respects firmer. In the steam coal trade, best Northumbrians are rather scarce, especially for forward sales; and the price is firm at about 10s. per ton f.o.b. Second-class steams are fairly plentiful, and the price is about 8s. 6d.; while steam smalls are firmer than they were, at from 4s. to 4s. 6d., according to quality. In the gas coal trade, the settlement of the large yearly contracts has attracted very great interest this time. The South Metropolitan contracts—about 1,200,000 tons—are fixed on a basis of from 7s. 6d. to 8s. per ton for good gas coals; and the large local contracts for the Newcastle and Gateshead Gas Company are likewise concluded. The latter are for some 280,000 tons; and the average price is about 7s. 10d. per ton. Other contracts are in course of arrangement; and the prices will probably show similar falls—about 6d. per ton less than those of a year ago. Coke is steady, with an increasing demand; and gas coke is benefited by this, and also by the decreasing output. Good gas coke is about 12s. 6d. to 13s. 6d. per ton f.o.b. on the Tyne.

Scotch Coal Trade.

The market is steady, with prices only slightly altered, but with a fair volume of business doing. Prospects are still hopeful. The quotations are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. to 9s. 3d., and splint 8s. 6d. to 8s. 9d. The shipments for the week amounted to 217,725 tons—a decrease of 5291 tons upon the preceding week, but an increase of 24,367 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,217,055 tons—an increase of 5672 tons on the same period of 1903.

Unsatisfactory Electric Lighting at Chelmsford.—At the monthly meeting of the Chelmsford Town Council on Wednesday, it was mentioned that, in consequence of complaints having been made of the unsatisfactory condition of the public and private lighting in the town, the Lighting Committee had had under consideration the advisability of appointing an inspector to test the illuminating power of the electric lamps in the borough and the supply of energy given, and had directed the Town Clerk to obtain information on the matter.

Gas-Works Improvements at Limavady.—A Local Government Board inquiry has been held at Limavady by Mr. A. D. Price into an application by the Council for a supplemental loan of £1600 for the purpose of improving the gas-works, which were recently acquired by the town. A new holder is the principal feature of the contemplated works; and Mr. M'Intyre, the Manager, explained the benefits that would accrue from the provision of further storage. Mr. S. B. Langlands, of Coleraine, and Consulting Engineer to the Council, gave particulars regarding the proposed holder. He was questioned by the Inspector as to the foundation, and admitted that special work had been considered necessary in order to make the foundation good. He believed the broad concrete base arranged for would be sufficient. The Inspector asked whether all the work specified to be done under the former loan had been carried out; and Mr. Langlands replied that it had not. All had, however, been done except some fittings connected with the retorts. The money had been absorbed. The Town Clerk (Mr. J. D. Boyd) explained that they had actually spent more than they borrowed; but they had built two sheds, which were not in the original specification. The Inspector said they should have confined themselves to the work in the estimate upon which the loan was granted. Mr. Langlands pointed out that he was not responsible for the original estimate, as it was made up before he had been called in. The Town Clerk said it was felt at the last inquiry that they had not asked sufficient money, but they did not care then to increase the amount in the application.

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Tavistock Gas Company, Limited.—At a meeting held last Wednesday, it was decided to wind up the Company voluntarily, and register a new one with increased capital. It was stated that, in the allotment of the new shares, preference would be given to shareholders who are consumers.

Dukinfield Water Supply.—Mr. S. Hague, the Borough Surveyor and Water-Works Manager of Dukinfield, in his report for the past year, says that the total quantity of water supplied to Dukinfield from Swineshaw, as registered by the meters in Stalybridge, for the past 52 weeks ending the 25th of December last was 139,722,000 gallons, or an average of 2,686,961 gallons per week. Of this quantity 15,907,000 gallons were supplied by meter for trade purposes; leaving 123,814,500 gallons for private consumption, watering the streets, fires, leakages, and burst mains and services, &c. The quantity for a population of 18,929 shows a consumption of 17·92 gallons per head per day on the net supply, as against 16·08 gallons for the previous year. The consumption in 1903 was 12,122,000 gallons more than in the previous year, and 12,322,000 gallons more than in 1901.

Unprotected Gas-Stoves.—An inquest was held by Dr. G. Danford Thomas, at Marylebone, last Thursday, concerning the death of Jessie Maggie Kilcullen, aged two years and nine months, the daughter of a tailor, of No. 15, Ossington Buildings, High Street, Marylebone. On the previous Sunday morning, the child's mother boiled a saucepan of water over a penny-in-the slot gas-stove, which stood on a stone in the centre of the kitchen, about 3 feet from the floor, wholly unprotected. Her intention was to wash the deceased and an elder child. Having turned out the gas, she had occasion to leave the room for a moment, when the deceased, in playing about, caught the handle of the saucepan, which capsized, its contents pouring over her, and inflicting severe and extensive scalds that soon proved fatal. The Coroner thought some guard should be placed round gas-stoves, which, as in the present case, are exposed on all sides, as the danger of an upset was considerable. The Jury returned a verdict of "Accidental death."

Boston (Mass.) Water Supply.—With the view of ascertaining exactly the extent of the water supplied per head of the population, the Boston Metropolitan Water and Sewerage Board took steps last year to measure the water furnished to each of the eighteen divisions of their area of supply. The first result obtained was that of the whole of the water pumped, 2⅓ per cent. was lost by leakage on its way to the meters. Figures obtained from areas in which the domestic supply was all metered showed that the true domestic consumption, including stables and gardens, did not exceed some 14 to 15 Imperial gallons per head per day. The trade supply in the Boston area is generally metered, and in all amounts to about 20·8 Imperial gallons daily; while the supply for public purposes, including schools, public buildings, street sprinkling, and fire service was found to be 5·68 Imperial gallons per day—making a total for water actually used of about 40·4 Imperial gallons per head per day. The actual supply has been, on the other hand, about 96 Imperial gallons per head per day. The meter observations taken showed, in accordance with European experience, that in districts in which the supply was large the night rate was excessive. Taking the district as a whole, the minimum rate of supply during the 24 hours is equivalent to nearly 62 Imperial gallons per head per day, at least three quarters of which must be absolute waste. It appears, however, that much of this arises from defective mains, since in certain areas every supply is metered; and the quantity used for street watering was also ascertained. The sum of these was only about two-thirds of the total shown by the Venturi meter as having passed into the district.

Messrs. Biggs, Wall, and Co. have secured an order from the Calcutta Corporation for 1000 "Crown" water-meters.

The Directors of the Imperial Continental Gas Association recommend a dividend of 5 per cent. for the six months ending the 31st of December last, free of income-tax.

The Yeovil Corporation have placed an order with the Chemical Engineering Company and Wilton's Patent Furnace Company for the supply of one of their saturators of a daily capacity of a ton.

A great flood was caused last week in the Reedyford district, at Nelson, by the bursting of the water-main from the Ogden reservoir. The water shot into the air in a column several feet in height; and in a very short time the whole neighbourhood, which lies rather low, was flooded. Tramcar traffic was stopped for some hours.

Messrs. F. C. Sugden and Co. have received a repeat order for semi-deep regenerator settings from the Cleckheaton Urban District Council, and orders for the same type of setting from the Tullamore Gas Company, and the Kirkheaton, Dalton, and Lepton Gas Company; also an order for shallow regenerators from the Quaker's Yard Gas Company.

We have received from Mr. B. G. Jenkins, F.R.A.S., his British weather chart for the current year. Mr. Jenkins is a scientific meteorologist; and on his chart he shows diagrammatically as well as by notes what kind of weather we are likely to have this year. As he has not been very far wrong up to now, his forecasts are entitled to be regarded as reliable. This is the eighteenth annual issue of the chart, which is published in two sizes by Mr. R. Morgan, Westow Street, Norwood.

The Chelmsford Town Council, at their meeting on Wednesday, decided to act on the advice of their Engineer, Mr. Percy Griffith, M.Inst.C.E., F.G.S., and accept the tender of Messrs. Davey, Paxman, and Co., of Colchester, for the new permanent pump proposed to be fixed at the Mildmay Road pumping-station. It will be placed at the unusual depth of 450 feet from the surface, and will be of special design to suit the peculiar circumstances of the case. There were 18 tenders for the work.

The Royston (Yorkshire) and District Gas Company, Limited, has been registered, with a capital of £10,000 in £1 shares, to take over an assignment of an agreement between H. Ellison and the Royston Urban District Council; to adopt an agreement between the New Monckton Collieries, Limited, and H. Ellison; to manufacture and supply gas and light to the parishes of Royston and Felkirk, or other places in Yorkshire; and to carry on the business of a gas and lighting company in all its branches. There will be no initial public issue.

An exhibition of gas appliances, under the auspices of the Hawick Gas Company, was held in the Exchange Hall in that town last week. There was a very good display of appliances, both for lighting and heating. At the opening on Monday evening, Mr. Noble, of Borthwickbrae, who presided, referred to the great advance there had been in the demand for gas appliances in recent years, and said the price of gas was never so low in Hawick as at present—being 2s. 11d. per 1000 cubic feet. Miss Dodds lectured during the week.

A copy of a very tastily got-up pamphlet has been forwarded to us by Messrs. John Wright and Co., of Birmingham. The cover leads one, in these times when there are wars and rumours of wars, to expect that it has perhaps some connection with the Far East or South Africa. It bears the title "The Plan of Campaign," and below is the picture of an open tent in which are military officers studying the "plan." But on investigating the contents, it is found that they deal with nothing more militant than the gas-consumption developing schemes which Messrs. Wright and Co. are prepared to carry out from beginning to end, under the system of deferred payment. Directors and managers who desire further information about this system can obtain it by becoming possessed of one of these booklets.

An inquiry was held last week, by order of the Board of Trade, before Mr. R. H. B. Marsham, Stipendiary Magistrate, and three Assessors, into the foundering of the Commercial Gas Company's steamship "Commercial," which was lost with thirteen hands off Whitby during January. The vessel, which was a steel one, built at Paisley in 1902 for the coal trade, was on a voyage from South Shields to London. The sole survivor was the second officer, who stated that the ship turned right over, and then went down. Mr. Marsham said the evidence was very meagre; but the Court found that the cause of the casualty was that the vessel, being somewhat overladen, ceased to have sufficient stability, and on her course being directed to land listed over under pressure of the wind. The loss of the vessel was not caused by the neglect of the second officer or of the registered managing owner.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS AND ELECTRICITY ENGINEER. Malvern Urban District Council. Applications by April 23.
MANAGER AND SECRETARY. Alfreton Gas Company. Applications by April 13.
FOREMAN (STOVE AND METER REPAIRING DEPARTMENT). Portsea Island Gas Company. Applications by April 11.
GENERAL FOREMAN. Dunfermline Gas Department.
WORKING FOREMAN. Ambergate Gas-Works. Applications by April 14.

Pupil Wanted. No. 4188.

Situations Wanted.

ASSISTANT-MANAGER. No. 4178.
MANAGER OR ASSISTANT. (Premium offered.) No. 4191.
MANAGER OR MANAGER AND SECRETARY. No. 4189.

Plant, &c., for Sale.

CONDENSER (250,000 feet). Redditch Gas-Works.
GASHOLDER. Staines and Egham Gas Company. Tenders by April 18.
PURIFIERS. Salisbury Gas Company.

Sales of Stocks and Shares.

BARKING GAS COMPANY. April 12.
DAVIS GAS-STOVE COMPANY, LIMITED. Herbert House, Denmark Hill, S.E.

Sales of Stocks and Shares—*continued.*

GLOVER AND MAIN, LIMITED. No. 4190.
GRAND JUNCTION WATER COMPANY. April 12.
HASTINGS AND ST. LEONARDS GAS COMPANY. April 12.
LOWESTOFT WATER AND GAS COMPANY. April 25
NEWCASTLE AND GATESHEAD GAS COMPANY. April 13.
TOTTENHAM AND EDMONTON GAS COMPANY. April 25.
WEST HAM GAS COMPANY. April 12.
WEST SURREY WATER COMPANY. April 12.

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MORLEY GAS DEPARTMENT. Tenders by April 12.
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RUDMORE WORKS.
STOVE AND METER REPAIRING DEPARTMENT.
WANTED, a Foreman to take Full Control (under the Engineer) of the above Department. Applicants must be capable of managing men, and must either have had Control, or be occupying a similar position.
Apply, by letter only, to the undersigned, stating Age, Wages required, with References, on or before April 11, 1904.
J. D. ASHWORTH,
Engineer.
Engineer's Office, Gas-Works,
Flathouse, Portsmouth,
March 25, 1904.

OXIDE OF IRON.
(NATURAL.)
BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL,
5, CROOKED LANE, LONDON, E.C.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

SULPHURIC ACID.
SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

THE Directors of the Alfreton Gas Company invite APPLICATIONS for the appointment of MANAGER and SECRETARY of their Gas-Works.
Salary £140 per Annum, with House, Co ls, Gas, &c.
Applicants must have had Experience in the Manufacture of Gas upon the latest principles.
Applications, with *copies* of Testimonials, to be addressed to the Chairman, Gas Offices, Alfreton, on or before April 13, 1904.
A. FORRETT,
Manager and Secretary.

AMBERGATE, &c., GAS-WORKS.
WANTED, a Working Foreman for the above Gas-Works, making about 7 million cubic feet of Gas per Annum. Must thoroughly understand the routine of a Gas-Works, and be able to lay Services, Fix Meters, and do general Gas-Fitting.
Commencing Wages 25s. per week, with good House, Rates paid, and Coal, Gas, and Water supplied.
Apply, in own handwriting, stating Age and References, to the undersigned on or before the 14th day of April.
JOSEPH RADFORD.
Gas-Works, Ambergate,
Near Derby.

AMENDED ADVERTISEMENT.
MALVERN URBAN DISTRICT COUNCIL.
GAS AND ELECTRICITY ENGINEER.
THE Council invite Applications for the appointment of GAS ENGINEER and MANAGER, and ELECTRICAL ENGINEER, at a Salary of £400 per Annum, with House, Coal, and Gas.
Candidates must have had practical experience in the management of Gas-Works with Inclined Retorts and Coal-Breaking and Elevating Machinery, and also thoroughly understand the manufacture of Sulphate of Ammonia. The make of Gas is about 130 millions.
Candidates must also have had Experience and have been a properly trained Electrical Engineer, and accustomed to an Alternating Current Station.
The person appointed will be restricted from engaging in private practice, and will be required to devote the whole of his time to the duties of his office.
Applications, endorsed "Gas and Electricity Engineer," stating Age, Qualifications, and Experience, and accompanied with *copies* of not more than Three recent Testimonials, addressed to me at the under-mentioned Office, not later than Saturday, the 23rd day of April, 1904.
Canvassing members of the Council, either directly or indirectly, will disqualify.
H. L. WHATLEY,
Clerk to the Council.
Council Offices,
Malvern, March, 1904.

WANTED to purchase Gas Shares, Stock, or Debentures of any good dividend-paying Company; also Water-Works Shares and Debentures. Size and location of Company immaterial. Securities that have failed to realize reserves at auction considered.
Address Mr. MARTIN, 41, Shrubbery Road, Streatham, LONDON.

TO BE SOLD—New Single Gasholder, 50 feet diameter by 15 feet deep, with Six Wrought-Iron Standards, top Ties, and Suspension Gear if needed. Ready for erection.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

TO SUBSCRIBERS.
ROBERT DEMPSTER & SONS, LTD., of Rose Mount Iron-Works, Elland, Yorkshire, beg to inform Subscribers to the "Journal of Gas Lighting," that the series of COLLOTYPE VIEWS OF GAS PLANT executed by them is being issued in the form of inserted sheets fortnightly, Six of which have already been published, and respectfully suggest that SUBSCRIBERS SHOULD PRESERVE THE WHOLE SERIES FOR FUTURE REFERENCE.

TEN £5 paid-up Shares in the Davis Gas-Stove Company FOR DISPOSAL.
Offers to Hebert House, Denmark Hill, London, S.E.

CONDENSER for Sale. In splendid Condition. Cheap. Capacity 250,000 Cubic Feet per Twenty-four hours.
Apply to A. E. Layton, Manager, Gas-Works, Redditch.

PURIFIERS.
THE Salisbury Gas Company desire to dispose of a set of Four PURIFIERS, each 12 feet square, Cockey's Dry-Faced Centre and Check Valves, Connections, Columns, and Girders for supporting same
Offers to N. H. Humphrys, Gas Engineer, Salisbury.

GLOVER AND MAIN, LIMITED.
FOR SALE—100 Ordinary Shares of £10 each, fully paid, in Glover and Main, Limited. The average of Dividends for last Five Years has been over 7½ per cent.
Offers to be sent to No. 4190, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill Dewsbury.

FOR SALE, Cheap, the following good Second-Hand Gas Plant:—
LIVESEY'S PATENT WASHER to pass 250,000 cubic feet per diem. 8-inch Connections.
COCKEY'S PATENT WASHER to pass 100,000 cubic feet per diem. 6-inch Connections.
KIRKHAM'S PATENT WASHER to pass 150,000 cubic feet per diem. 5-inch Connections.
W.I. SCRUBBER, 20 feet high by 3 feet diameter.
Two 8 feet square PURIFIERS, with 8-inch Valves complete.
Also various other GAS PLANT. Inquiries invited.
Apply to Samuel While and Son, 60, Queen Victoria Street, London, E.C.

STAINES AND EGHAM GAS COMPANY, LIMITED.

GASHOLDER FOR SALE.

THE Directors invite Tenders for the purchase (Buyer to dismantle and remove) of a TELESCOPIC GASHOLDER, 50 feet diameter, Two Lifts 18 feet, Eight Cast-Iron Standards, Intermediate Girders, and Cast-Iron Tank complete. The Plant can be seen by appointment with the Manager.
Sealed Tenders, endorsed "Holder," to be delivered to me on or before Monday, April 18 next.
The Directors do not bind themselves to accept the highest or any Tender, and reserve the right of accepting the whole or a portion only of any one Tender.

By order,
Geo. H. Sayers,
Secretary.

Gas Offices: The Causeway,
Near Staines, March 25, 1904.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF £50,000 ORDINARY STOCK.

THE Directors offer for Sale by Tender £50,000 ORDINARY STOCK, to be issued under the provisions of the Newcastle-upon-Tyne and Gateshead Gas Act, 1901. Applications receivable up to Ten a.m. on the 13th of April, 1904.
When Gas is charged at the present rate of 2s. per 1000 cubic feet, the Authorized Dividend is £4 12s. 6d. per cent.
Any amount of Stock, being not less than £5, or a multiple thereof, may be applied for. A deposit of 5 per cent. on the nominal amount of Stock applied for must accompany each Tender, and the balance be paid on or before the 30th of June, 1904. Interest at the rate of 4½ per cent. per annum will be allowed upon prepayments.
MINIMUM PRICE, £105 10s. PER CENT.
The Company's profit for the year 1903 was £112,106; and after paying all interest and full statutory dividends, there was left a surplus profit of £24,658.
During the last five years, the number of consumers has increased by 26,276, and the gas sold by 425,177,000 cubic feet.
Prospectuses and Forms of Tender will be sent on application to the undersigned.

Thos. Waddom,
Secretary.

Newcastle-upon-Tyne,
March 29, 1904.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

OXIDE OF IRON.

THE above Board are prepared to receive TENDERS for the supply of New OXIDE OF IRON and for the disposal of the SPENT OXIDE now at their Gas-Works, Hebden Bridge.
Further Particulars may be had on application to the undersigned.

E. J. Wellens,
Engineer and Manager.

Gas Offices, Hebden Bridge,
March 29, 1904.

MORLEY CORPORATION.
(Gas Department.)

THE Gas Committee are prepared to receive TENDERS for the supply of the METERS, TUBES, IRON, LIME, OIL, and other Sundries required by them during the Year ending March 31, 1905.
Forms of Tender, with full Particulars, may be obtained on application to H. J. Hemingway, Gas Office, Town Hall.
Tenders to be sent to the undersigned not later than Tuesday, April 12.

Fred. Thackray,
Town Clerk.

Town Hall, Morley,
April 5, 1904.

BOROUGH OF REIGATE.

SEWAGE DISPOSAL.

THE Council of the Borough of Reigate invite TENDERS for the supply and delivery of FILTERING MATERIAL for Bacteria Beds required at the Sewage Works, Earlswood, within the said Borough.
Further Particulars may be obtained upon application to the Borough Engineer, Municipal Buildings, Reigate.
Tenders, accompanied by samples of material, must be sent in to me at my Office, Municipal Buildings aforesaid, endorsed "Tender for Filtering Material," not later than noon on Saturday, the 9th of April.
The Council do not bind themselves to accept the lowest or any Tender.
Given under my hand this 25th day of March, 1904.

By order,
Clair J. Grece,
Town Clerk.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

SPENT OXIDE OF IRON.

THE Commissioners are prepared to receive OFFERS for the removal of from 5 750 Tons of SPENT OXIDE OF IRON, containing not less than 50 per cent. of free Sulphur.
Full Particulars and further Information can be obtained upon application to Mr. W. R. Herring, Chief Engineer and Manager, New Street Gas-Works, Edinburgh.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

GAS COAL AND CANNEL.

THE Commissioners are prepared to receive TENDERS for the supply of GAS COAL and CANNEL for delivery at their Edinburgh and Granton Works over a period of Twelve Months or more.
The Contractors must guarantee that, in the execution of their Contracts, they will pay the standard rate of wages, or such wages as are generally recognized as fair in their business.
Further Particulars, Schedule, and Form of Tender may be obtained on application to the Chief Engineer, Mr. W. R. Herring, at the Gas-Works, New Street.
Tenders to be lodged by Ten o'clock on Monday Forenoon, the 11th prox. in sealed envelopes, marked "Tender for Coal," and addressed to the undersigned.
The Commissioners are not to be bound to accept the lowest or any Offer.

James M'G. Jack,
Clerk.

25, Waterloo Place, Edinburgh,
March 24, 1904.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

STORES.

THE Commissioners invite Tenders for the supplying of:—

Lime,	Cast-Iron Pipes and Connections,
Oils and Paints,	Yarn, &c.,
Timber,	Iron, Steel, and Implements,
Meters,	Iron Castings, &c., &c.,
Gas-Fitters' Stores,	Causeway Repairs,
Wrought-Iron Tubes and Fittings,	Cartages,

required for their various Undertakings during the Year, from Whitsunday first.
The Contractors must guarantee that, in the execution of their Contracts, they will pay the standard rate of wages, or such wages as are generally recognized as fair in their business.
Tender Forms and all Information can be had on application to the Chief Engineer and Manager, at the Gas-Works, New Street.
Offers must be lodged not later than Ten o'clock on Monday Forenoon, the 11th prox., in sealed envelopes, addressed to the undersigned, and marked "Tender for Lime," or as the case may be.
The Commissioners are not to be bound to accept the lowest or any Tender.

James M'G. Jack,
Clerk.

25, Waterloo Place, Edinburgh,
March 24, 1904.

BRIDGEWATER COLLIERIES COKE-WORKS.
(The Earl of Ellesmere).

TENDERS are invited for the Light Oil produced at the above Works for a period of Six or Twelve Months from the 1st of May, 1904, delivered into contractor's tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley branch of the L. & Y. Railway; or at the Brackley Siding, on the Little Hulton Mineral branch of the L. & N. W. Railway.
Tenders, endorsed "Tenders for Light Oil," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Office, 4, Chapel Walks, Manchester, on or before the 16th of April.

WALLASEY URBAN DISTRICT COUNCIL.
(Gas and Water Department.)

TO COLLIERY OWNERS AND OTHERS.

THE Wallasey Urban District Council are prepared to receive TENDERS for the supply of about 32,500 Tons of GAS COAL and CANNEL for their Gas-Works, delivered in trucks at Duke Street, Birkenhead, or into the Works, *via* the Wirral Railway, separately for One, Two, or Three Years, from the 30th of June next.
A copy of the Specification and any further Information can be obtained on application to the Engineer, Mr. J. H. Crowther, at his Office at the Works, Great Float, near Birkenhead.
Sealed Tenders, on the Contractor's own Form, endorsed "Tender for Gas Coal and Cannel," and addressed to the undersigned, to be delivered at my Office as below not later than the 20th of April, 1904.
The successful Contractors will be required to enter into a bond, with approved sureties, for the due fulfilment of their respective Contracts.
The Council do not bind themselves to accept the lowest or any Offer.

By order,
H. W. Cook,
Clerk and Solicitor.

Public Offices, Egremont,
Cheshire, March 23, 1904.

WALLASEY URBAN DISTRICT COUNCIL.
(Gas and Water Department.)

SUPPLY OF STORES.

THE Wallasey Urban District Council are prepared to receive TENDERS for the supply, over a period of Twelve Months from the 30th of June next, of the following among other Articles; being the principal STORES required for use at their Gas and Water Works—viz.,

Steam Tubing.	Wrought-Iron Bars, Plates, &c.
Gun-Metal Stopcocks, Ferrules, Unions, &c.	Gas-Fittings.
Lead Pipe.	Wash Leathers.
Retorts and Fire-Bricks.	Cast-Iron Main Pipes.
Buxton Lime.	Gas and Water Meters.
Bolts and Nuts, Setpins, &c.	Copper Sheets, &c.
Lamp Columns.	Cast-Iron Street Boxes.
Iron and Brass Main Cocks.	Oils, Brushes, and Vestas.
Valves and Hydrants.	Firebars.
Block and Sheet Tin.	India-Rubber Tubing, &c., &c.
Vitriol.	

Samples referred to in the Schedule may be seen, and Forms of Tender obtained, on application to the Engineer, Mr. J. H. Crowther, at his Office at the Works, Great Float, near Birkenhead.
Sealed Tenders on the Form provided, endorsed "Tender for Gas and Water Stores," and addressed to the undersigned, to be delivered per post at my Office as below, not later than the 20th of April, 1904.
The successful Contractors will be required to enter into a bond, with approved sureties, for the due fulfilment of their respective contracts.
The Council do not bind themselves to accept the lowest or any Offer.

By order,
H. W. Cook,
Clerk and Solicitor.

Public Offices, Egremont, Cheshire,
March 23, 1904.

GRAND JUNCTION WATER-WORKS COMPANY.

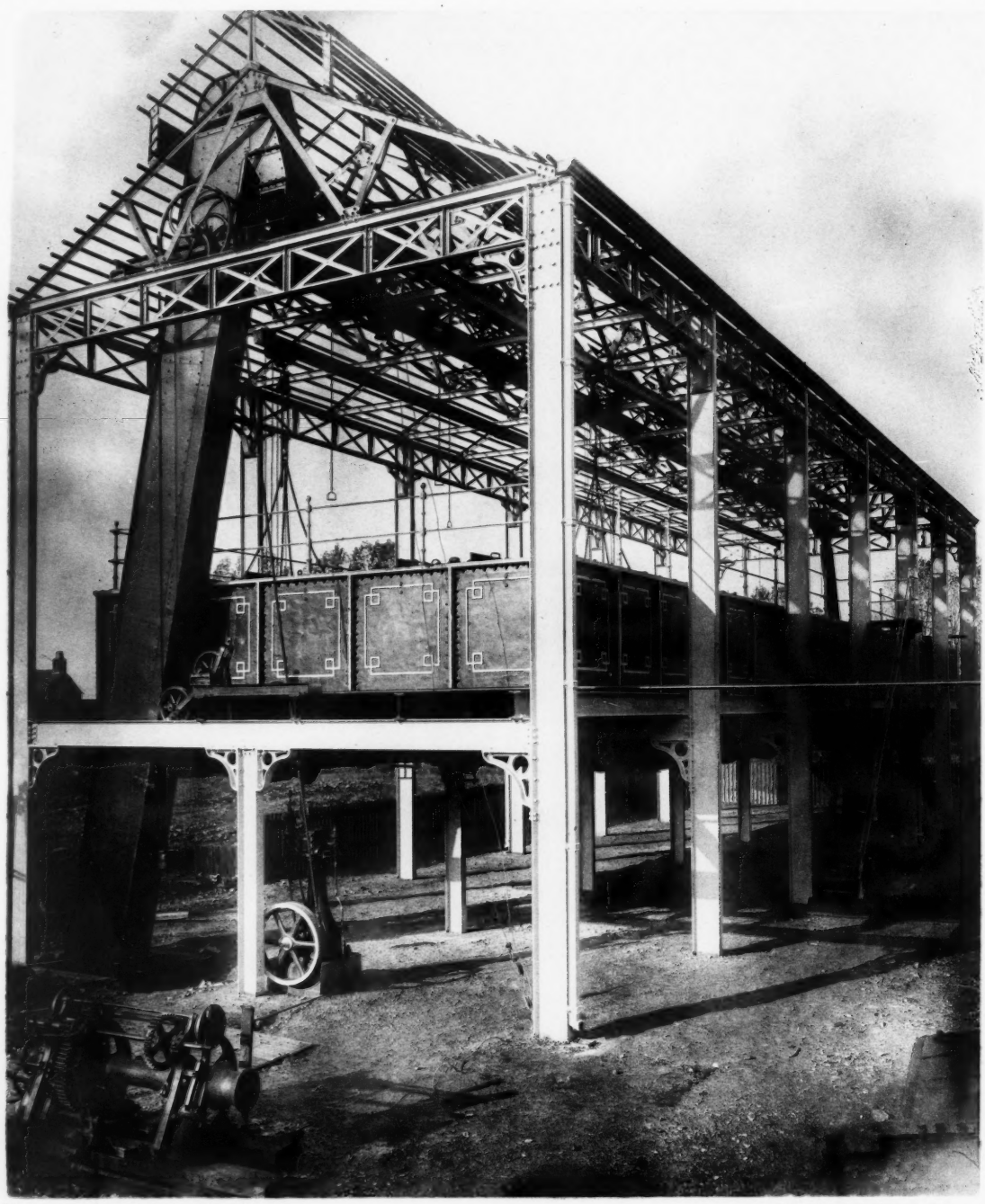
SALE BY TENDER OF THREE-AND-A-HALF PER CENT. REDEEMABLE DEBENTURE STOCK.

Grand Junction Water-Works Act, 1902.

NOTICE is Hereby Given, persuant to the Grand Junction Water-Works Act, 1902, that the Directors of the Company intend to offer for SALE BY TENDER such an amount of THREE-AND-A-HALF PER CENT. REDEEMABLE DEBENTURE STOCK created under that Act as will produce, after payment of expenses, the sum of £100,000 cash.
This Stock may be redeemed at par at any time after the expiration of 25 Years from the date of issue on Six Months' previous notice in writing to the holder.
On the transfer of the Company's Undertaking, persuant to the Metropolis Water Act, 1902, this Stock will, under the provisions of that Act, be secured on the Water fund of the Water Board, and have, in addition, the security of the rates, as provided by that Act.
Tenders must be delivered at the Company's Offices, 65, South Molton Street, W., not later than Twelve o'clock noon, on Tuesday, the 12th day of April next.
The Purchase Money must be paid on the 24th day of April, and Interest at the rate aforesaid on the Stock will commence to accrue from the date of payment, and be paid at the same time the interest is paid on the existing Debenture Stock.
Particulars and Conditions of Sale, together with Form of Tender, may be obtained at the Offices of the Company, or will be forwarded on application.

By order of the Court of Directors,
J. Goodwin,
Secretary.

65, South Molton Street, W.,
March 14, 1904.



Hereford Corporation Gas Works. W. Parlby, Engineer.

4—25'-0" SQUARE PURIFIERS WITH SUPERSTRUCTURE, ROOF, OXIDE ELEVATOR AND CONVEYOR,

MADE AND ERECTED IN 1903. BY

ROBERT DEMPSTER & SONS LTD., ELLAND, YORKS.

Printed for Walter King, by King, Sell & Olding, Ltd.; and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, April 5th, 1904.

Collotype by Waterlow & Sons Ltd.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

GAS AND WATER ORDINARY STOCKS AND SHARES
IN THE
WEST SURREY WATER COMPANY,
BARKING GAS COMPANY,
WEST HAM GAS COMPANY.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 12, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

HASTINGS AND ST. LEONARDS GAS COMPANY.

SALE BY AUCTION OF
£10,000 ADDITIONAL 5 PER CENT. ORDINARY STOCK
Ranking for 5 per cent. Dividend subject to the Sliding-Scale; the last Dividends on similar Stock in the Company having been £6 1s. per cent. per annum.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart., London, E.C., on Tuesday, April 12, at Two o'clock, by Order of the Directors.
The Company was established in 1832, and supplies gas in the favourite and rapidly-growing South Coast health and pleasure resorts of Hastings and St. Leonards, as well as the adjacent districts. The total authorized capital is £770,000, of which £404,417 has been issued. The sales of Gas have risen from 321 Million cubic feet in 1893 to upwards of 440 Millions last year. There are nearly 10,500 consumers, upwards of 6700 Gas-Stoves are in use; and, after paying the full statutory dividends to the 31st of December last, £46,479 was brought forward to the current half year as Undivided Profit, which is available for use as a Reserve Fund.
The New Capital is required to meet the continued increase in the Company's business. It will be issued free of stamp duty or other expenses, and purchases can be made either by the Secretary of the Company or the Auctioneer, without charge, for Investors unable to attend the auction.
Detailed Particulars of Sale, with Form of Instructions for the Secretary or Auctioneer to purchase, obtainable, post free, at the Company's General Offices in Queen's Road, Hastings, or of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £12,500 ADDITIONAL "B" CONSOLIDATED STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, April 25, at Two o'clock precisely, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY £10 SHARES, AND £1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, April 25, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Now Ready. Price 5s. 6d. Post Free.

REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1903.

The publication of these Volumes commenced in 1883 and most of them are still on sale.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

BOOKS AND LEAFLETS
TO BE OBTAINED OF
WALTER KING,
11, BOLT COURT, FLEET STREET, E.C.

CHURCH LIGHTING.— By J. H. TROUGHTON, *Price 9d. per dozen*; 100, 4s. 6d.

THE CHOICE OF GAS-FIRES.—By THOS. FLETCHER, F.C.S. *Price 3s. per* 100. Special Quotations for large Quantities.

GAS AND HOW TO USE IT.— By J. H. TROUGHTON. *Sample copies 6d. each.* 100, £2; 250, £4 10s.; 500, £7 10s.; 1000, £10.

ANALYSIS OF THE ACCOUNTS OF THE METROPOLITAN WATER COMPANIES (Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex), and of the CORPORATION WATER UNDERTAKINGS OF EDINBURGH, GLASGOW, and MANCHESTER, for the Year 1902-1903. By WOOD, DREW, & Co., Chartered Accountants. *Price 15s.*

BIRMINGHAM CORPORATION (Windsor Street) GAS-WORKS.—By CHARLES HUNT, M.Inst.C.E. *Price 21s.*

THE COMPOSITION AND USE OF GAS LIME IN AGRICULTURE.—By (the late) Dr. VOELCKER, Professor of Chemistry to the Royal Agricultural Society of England. *Price 5s. per* 100.

NOTES ON WATER SUPPLY.—By J. T. RODDA, Assoc.M.Inst.C.E., Assoc.M Inst.Mech.E., Member of the British Association of Water-Works Engineers. *Price 5s.*

INTERNATIONAL ENGINEERING CONGRESS (GLASGOW, 1901))—THE PROCEEDINGS OF THE GAS SECTION. Edited by J. W. HELPS, M.Inst.C.E. *Price 5s.*

HANDBOOK FOR GAS ENGINEERS AND MANAGERS.—By THOMAS NEWBIGGING, M.Inst.C.E. (New Edition in course of Preparation).

AGRICULTURAL VALUE OF GAS LIME.—By CHARLES D. PHILLIPS, J.P. *Price 10s. 6d. per* 100.

CONSTRUCTION OF GAS-WORKS.—By S. HUGHES. *Price 5s. 6d.*

GAS LIGHTING.—By CHARLES HUNT. *Price 18s.*

GAS MANUFACTURE FOR STUDENTS.—By J. HORNBY. *Price 5s.*

GAS ENGINEERS' POCKET BOOK. — By H. O'CONNOR. *Price 10s. 6d.*

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HAVE ACQUIRED
THE
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"HELICOID"
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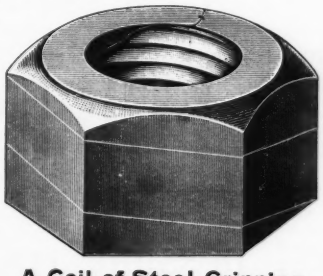

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SECURITY. ECONOMY. DURABILITY.
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Made from ½ in. to 2 in. Price from 10s. 9d. per gross.
COMPLETE LIST FREE.
BAYLISS, JONES & BAYLISS, LIMITED
ALSO MANUFACTURERS OF
IRON AND WIRE
FENCING,
GATES, &c.
VICTORIA WORKS— **WOLVERHAMPTON.**
London Offices & Show Rooms, 139 & 141, Cannon Street, E.C.

SAVE MONEY LABOUR
Imperial Cookers give no trouble, and for quality and cheapness cannot be excelled.
TWO GOLD MEDALS
in Six Months.
Our Gas-Cooker Orders last Year were
455 % (per cent.)
more than in 1902.
THE IMPERIAL STOVE CO.,
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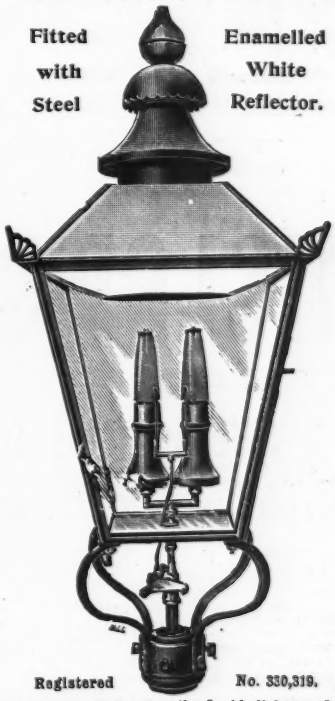
THE
"ROTARY" STATION METER.
Efficiency Demonstrated.
APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

THE
"KILBURN" LANTERN.
Fitted with Steel
Enamelled White Reflector.



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H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1693 HOP.
Telegrams: "LUMINOSITY LONDON."

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PATENT
CANDLE SAFETY LAMPS.
Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7 or 9 hours.

48, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
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90, CANNON STREET, E.C.

RAILS.
New and Second-Hand with all Accessories; also Tip Waggons and Turntables.
B. M. RENTON,
MIDLAND WORKS,
SHEFFIELD.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
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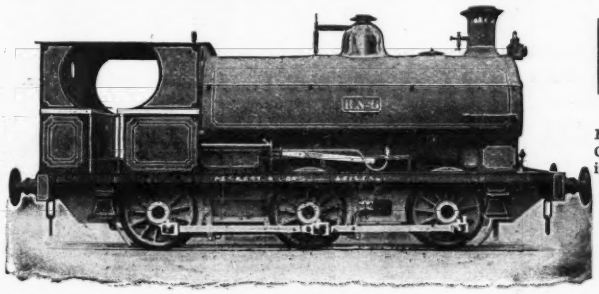

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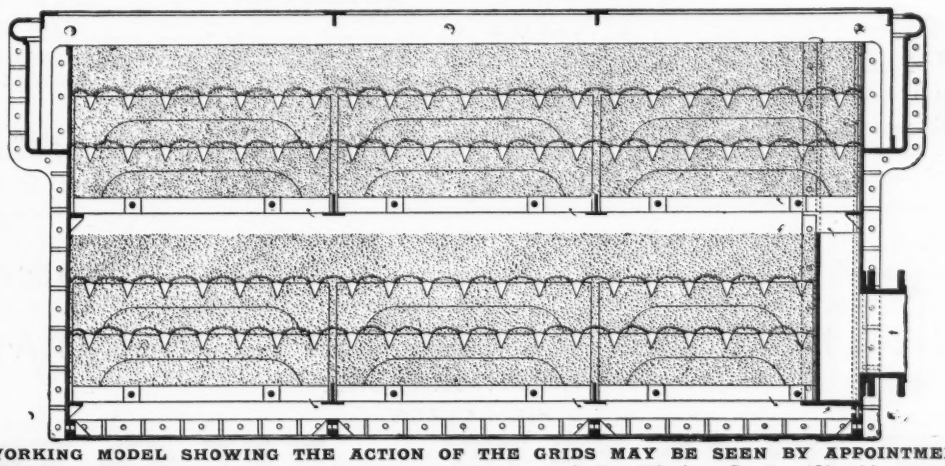

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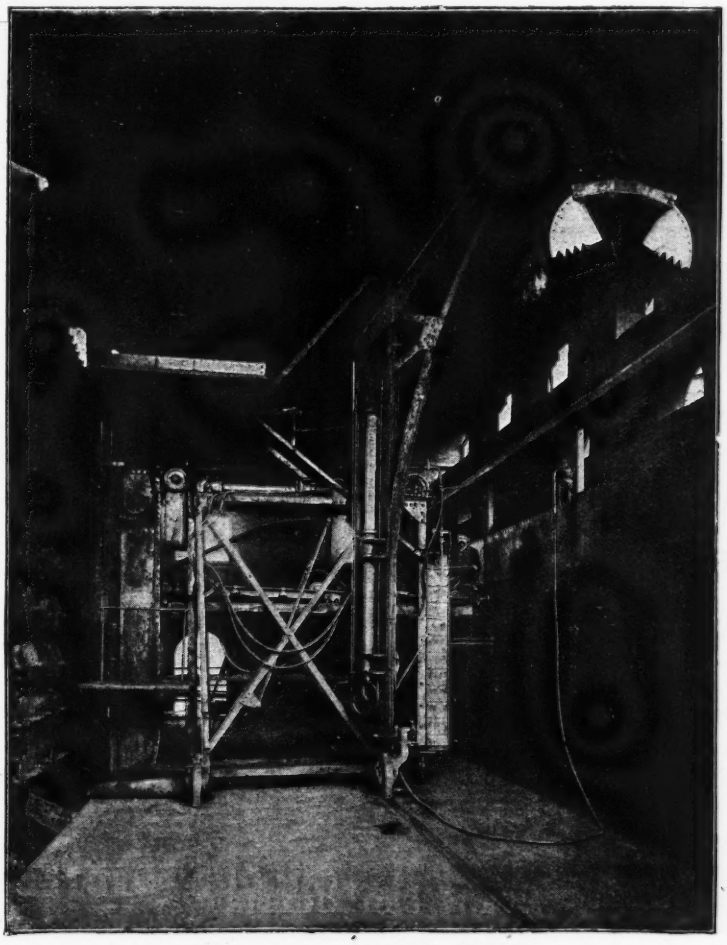

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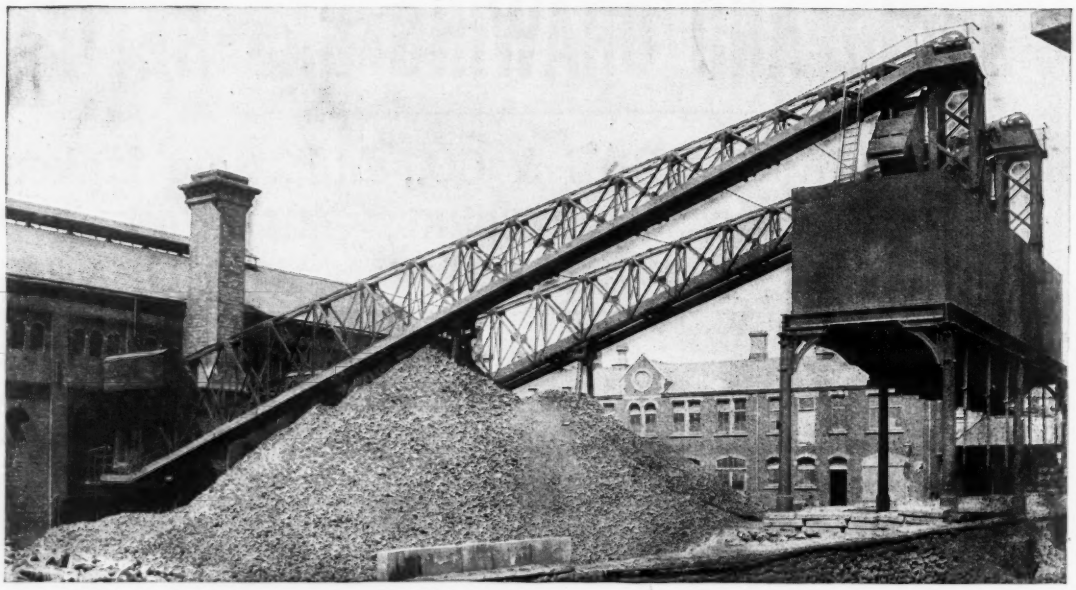

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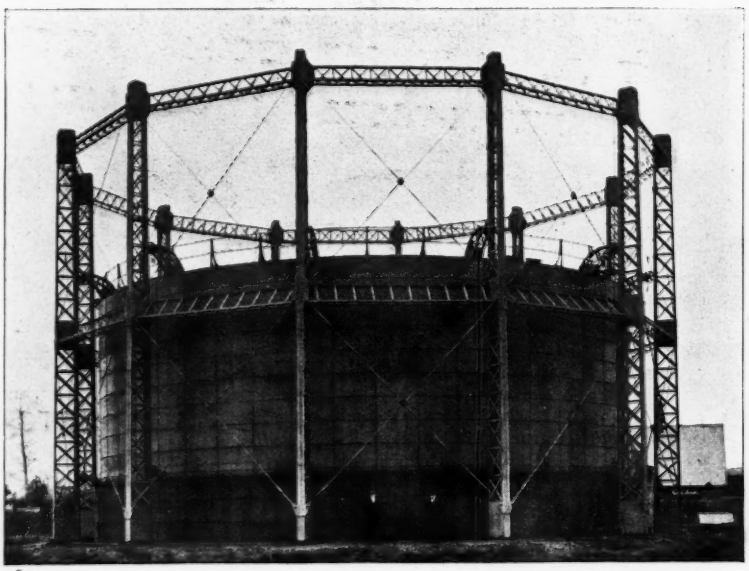

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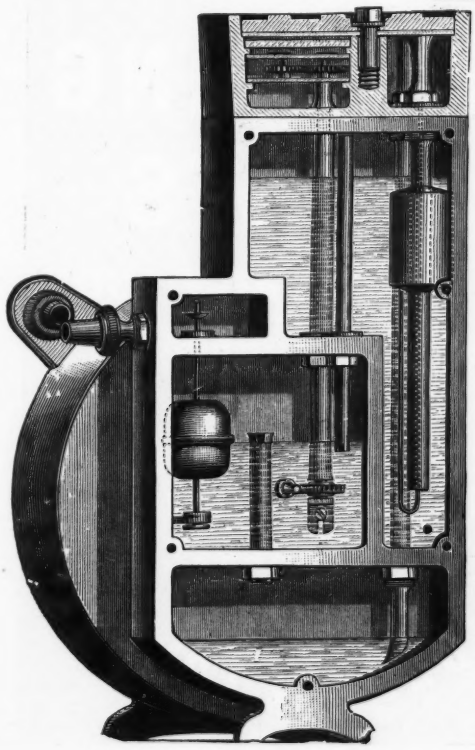

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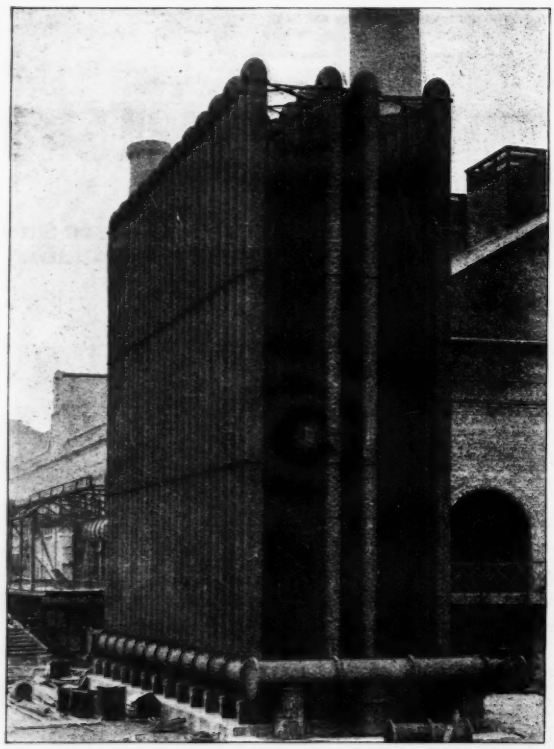

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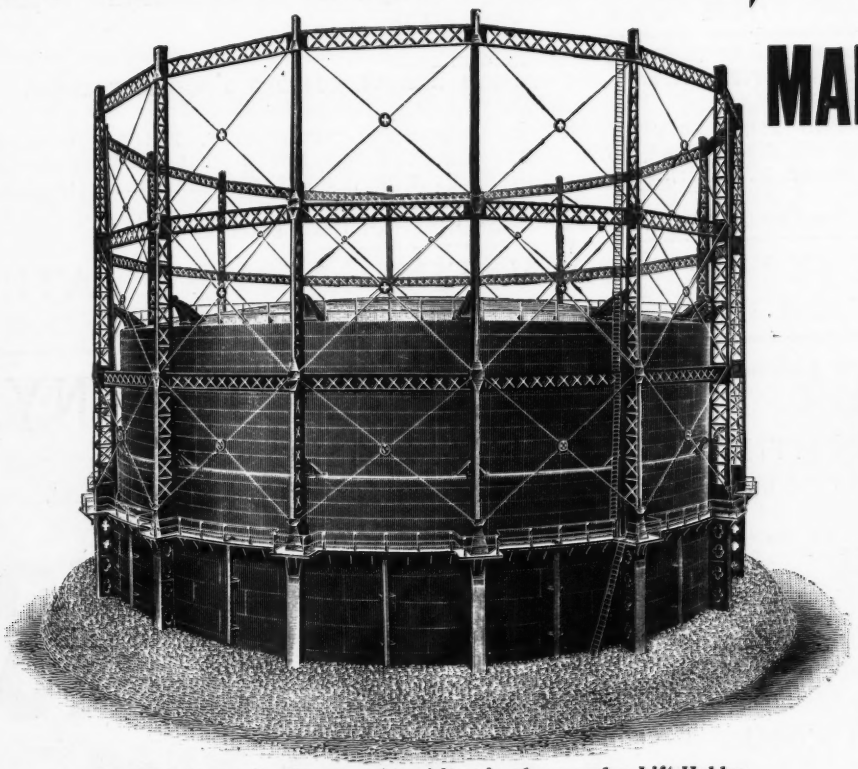

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